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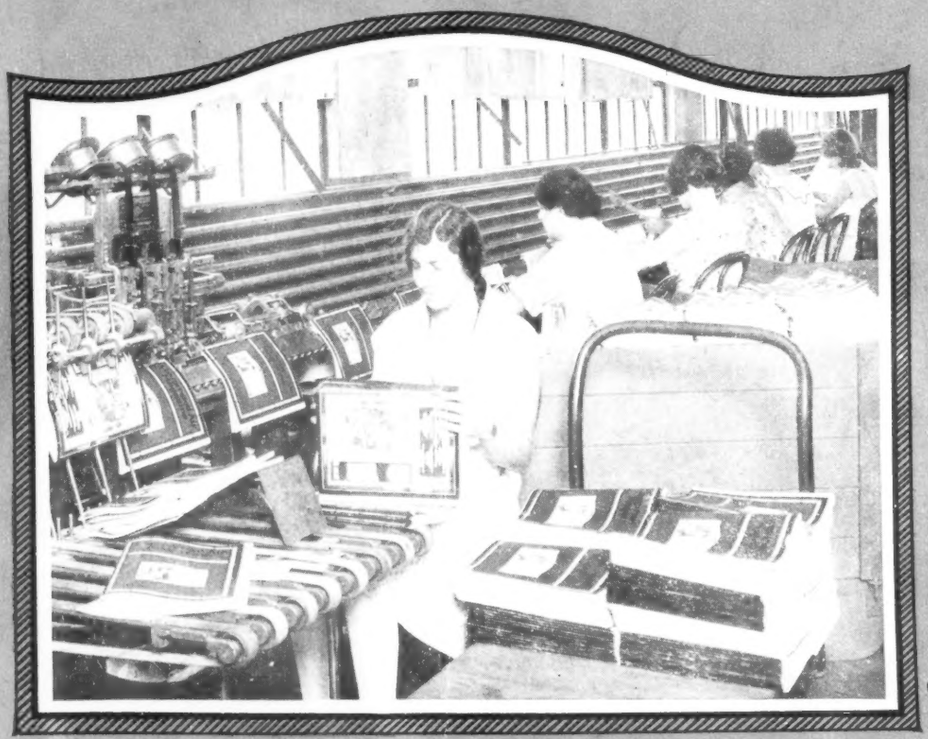

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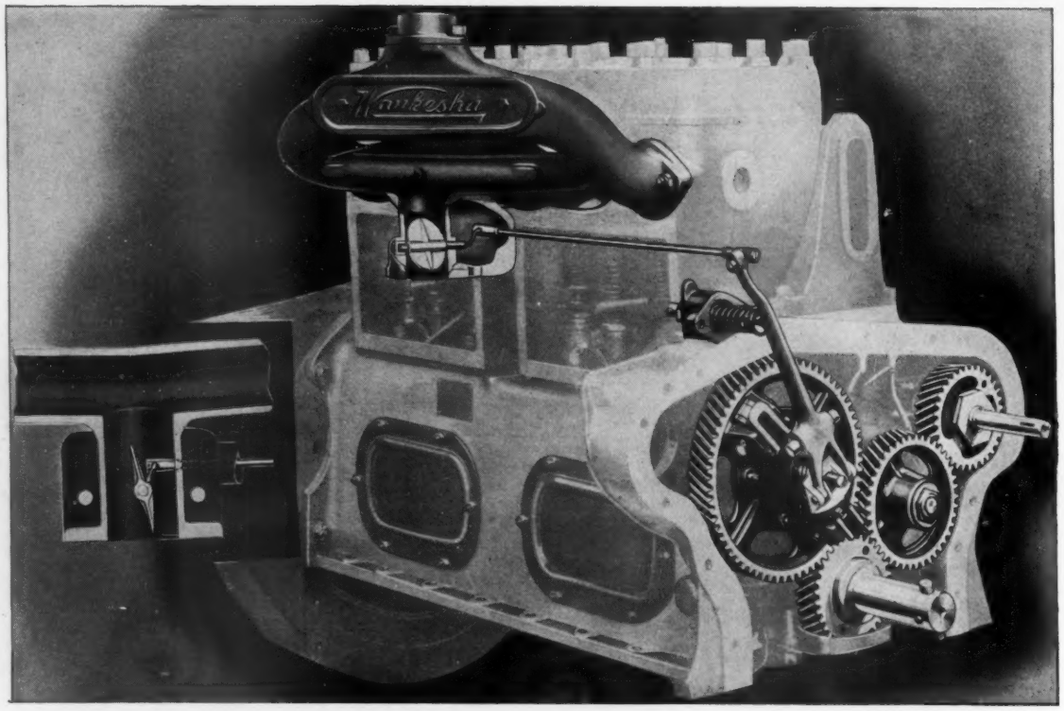
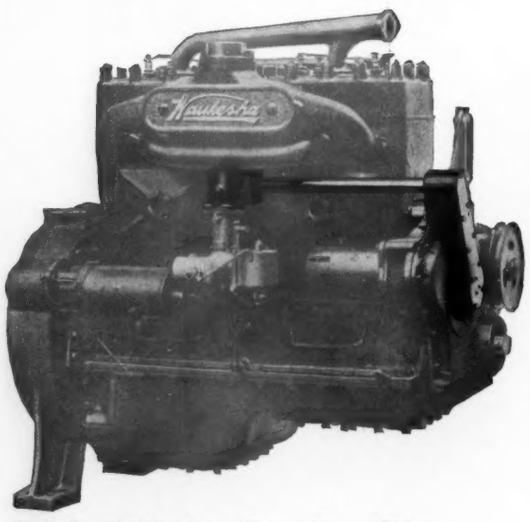


PROTECTION that is Built-In

THE governor of every Waukesha Engine is *not an accessory.* It is a protective device . . . . *built with and into the engine* so that it cannot be tampered with . . . and it saves both the engine and its owner from the consequences of over-speeding.

Positive and automatic in action, self-lubricating, and accurate in speed control . . . . it not only prevents engine racing but assures steady, even speed at all times, from no load to engine capacity. No hair-trigger throttling is necessary . . . . the governor always responds instantly to every load demand. And it prevents that alternate increase and decrease in speed known as "hunting."

The result of a basic design successfully applied and built by Waukesha for more than ten years . . . . this governor is at once a safeguard and an assurance of long life.



Bulletin 556 describes the engine. Write *Industrial Equipment Division, Waukesha Motor Company, Waukesha, Wisconsin. Offices: New York, 8 West 40th Street; San Francisco, 7 Front Street.*

983

WAUKESHA ENGINES

As It Seems To Us

SHIP-AND-SHORE RADIO 'PHONE

WE COMMENTED a while back on the reported equipping of certain fast German trains with a radio-telephone system that makes it possible for passengers on the trains to communicate with persons in touch with established telephone systems or to be reached in the same way while speeding on their journeys. It still seems to us that such a system of vocal communication has its drawbacks, because the tired man of affairs thus would have no escape from his office and its recurrent demands upon his attention.

We have a repetition in principle of this situation in costly work now being done by one of America's great telephone organizations. The engineers of this company are perfecting a system of radio-telephony that has already enabled ship and shore to maintain vocal contact throughout the transatlantic voyage of a suitably equipped steamship. Admitting that facilities of this sort might be of occasional service of great value, we still stick to the old-fashioned belief that the average voyager looks upon a sea trip as a means of isolating himself from the exactions of business. The radio-telephone will certainly make it harder for him to insure himself this restful seclusion.

REFORESTATION GAINS HEADWAY

PROBABLY but few of the general public are aware of what some paper companies are doing towards reforesting cut-over timberlands. Some of these enterprises are resorting to selective cutting so that young trees shall be left standing to attain their maturity in the years to come instead of being wastefully sacrificed now, while other companies are doing similar work in the direction of conservation and, at the same time, replanting the cut areas. This is significant of an aroused consciousness of the need of insuring supplies of timber if the manufacture of wood-pulp paper is to continue on a large scale in the future.

Happily, the policy of reforestation is winning favor with a steadily growing percentage of the populace; and this has been vouched for in a report recently issued by the United States Department of Agriculture. According to the Forest Service of that department, fully 68,565,000 trees were furnished by 34 states and by Hawaii and Porto Rico during 1928; and these trees were utilized to restock farm timberlands. Some of the trees were sold at cost, while a great many others were distributed without charge. New York and Pennsylvania each provided 9,000,000 trees for reforestation. Large as the total number seems, it is but a drop in the bucket compared with the unrepaired wastage that has occurred in the past; and the good work that has already been done in restocking cut-over timberlands should serve as an example to be followed earnestly on an ever increasing scale. Measured in terms of years instead of in spans of months, trees can be grown as profitable crops just like any other product of the land.

The Season's Greetings

AGAIN it is our pleasure to wish the readers of Compressed Air Magazine a very Happy New Year and a full measure of success in all their undertakings.

From time to time, we have been privileged to describe the outstanding activities of some of our readers—activities that are true object lessons in achievement and in work well done.

We feel that we can make our pages even more valuable in the current year if our readers will help us to a knowledge of worthwhile things recently done or being done. In that way we may be able to gratify our earnest desire to be of still greater use and service to a larger number.

MOBILIZING FOR PROSPERITY

PROBABLY no more impressive example of the meaning of the word "teamwork" can be cited than that of the recent industrial conferences held in Washington at the instance of President HOOVER. In the face of a potential spread of economic pessimism, to a very large extent based upon a psychological reaction to unwise and costly speculation in the stock market, the Nation's Chief Executive has set about in a practical way to restore confidence by drawing upon our captains of industry of all sorts for collaboration and by disclosing a wealth of facts that indicate how really sound is American business as a whole.

Instead of asking for the opinions of the casual observers of our industrial life, he wisely elected to seek the counsel of the "keymen" of our diversified national business. This procedure has served a manifold purpose: It has given great weight and significance to the several conferences; it has brought together outstanding financial and industrial leaders for a common exchange of knowledge and views; and, finally, it is in a fair way to effect a mutuality of interests that will make for incalculable good by promoting cordial relations and a greater feeling of interdependence.

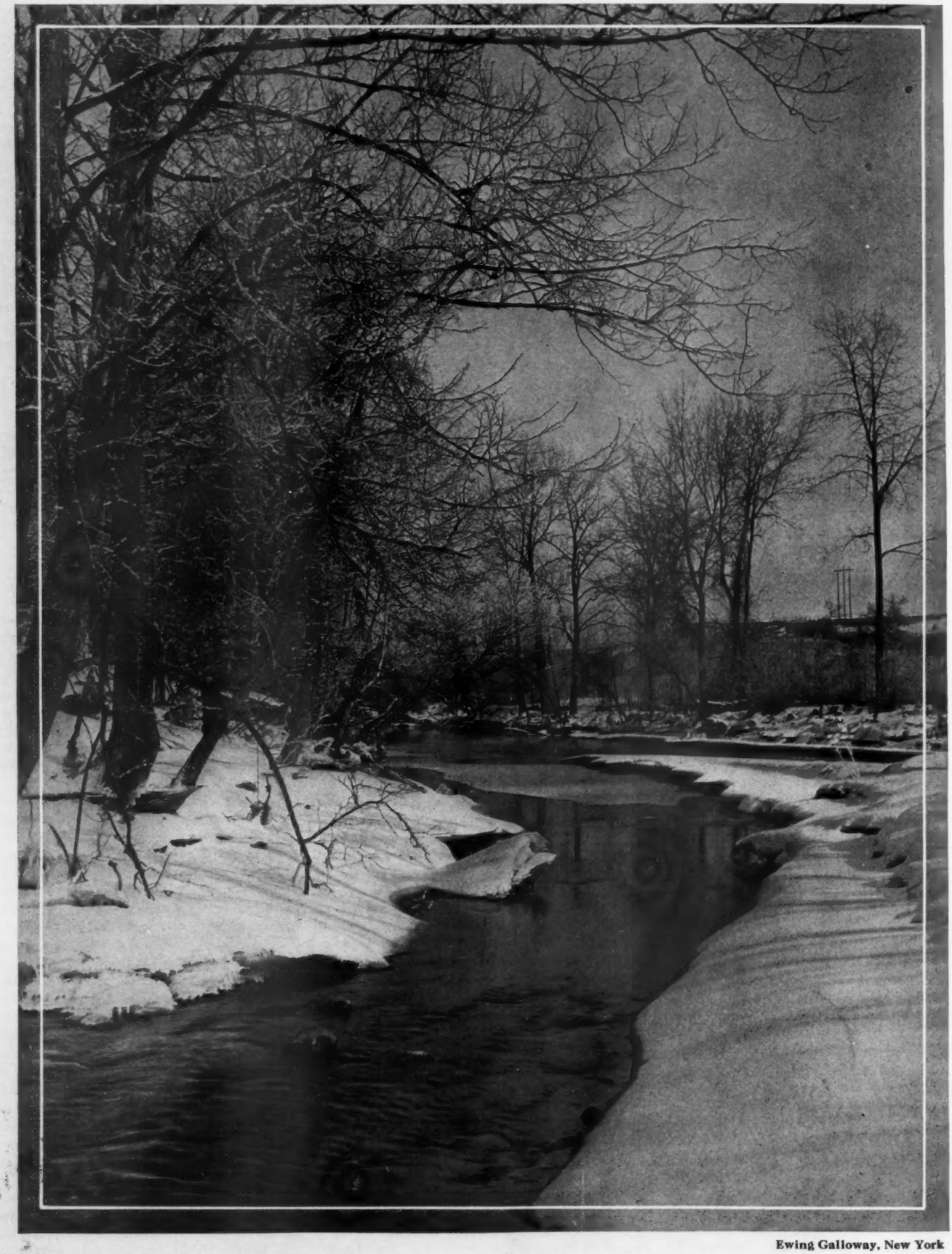
Out of the various conferences has been born a supercouncil of twenty whose function it will be to do their utmost to safeguard the continued well-being of American industry. Their responsibility will be to develop "a program designed to make weak businesses strong and strong businesses stronger". The immediate revelation is that the country as a whole is ready to spend many hundreds of millions of dollars to keep our varied activities in full swing; and in the end it will be possible for us to surmount our difficulties and to insure our continued prosperity if all of us will put our shoulders to the wheel and WORK! The chance to do so will be there if each so chooses.

BYRD'S SOUTH POLAR TRIUMPH

AS news travels today, any comment on our part upon Commander BYRD'S accomplishment might seem belated now; but we want our pages to register, if only briefly, our estimate of that splendid achievement. It will serve, at least, as a milestone to future readers to mark the progress made since the first antarctic explorers tried to wrest from Nature the secrets of that grim and forbidding section of the globe.

The relatively brief span of BYRD'S aerial journey to and from the South Pole seems to belittle the significance of the venture when compared with the hazards and the exhausting toil with which the men had to contend who previously sought the same goal. But time in actual performance is not in itself of the essence of this particular triumph over opposing Nature, because a vast deal of time and no end of careful planning were necessary to prepare the expedition for its work and to outfit BYRD for the climax achieved. BYRD built upon the experience of earlier explorers—as only a wise man would be expected to do; and then he drew upon his own knowledge and put to his use facilities and scientific aids that have but lately become available.

Aircraft, radio, and gasoline motors have contributed to success; but none in itself would have counted for much had not each been assigned its respective field of service only after painstaking study of every phase of the problem involved. Accomplishment has been the reward of preparation, coördination, and courage on the part of all concerned; and the world will be the richer for the data obtained at great risk.



Ewing Galloway, New York

"If Winter comes, can Spring be far behind?"

Ewing Galloway, New York

"Gold Is Where You Find It"

Luck, Accident, and the Persevering Prospector Were Factors in the Discovery of the Rich Mines of the West

By C. H. VIVIAN

HE who traces out the beginnings of the famous old mining camps of the West has impressed upon him the verity of the old adage, "Gold is where you find it."

By contrast, the quest for petroleum has been reduced to a science. With plane table and alidade, the geologist reads the surface structural conditions. With torsion balance and seismograph, he even peers beneath the crust. He can outline the limits of the oil-bearing strata and be fairly certain that most of the holes put down within those borders will be productive. But the search for gold still calls for diligent scrutiny and painstaking probing. Even where a broadly mineralized zone is found, the locating of the individual ore-bearing veins demands patient prospecting.

A streak of rust at the surface may lead to "high-grade." Or, conversely, rich surface ore may peter out with depth or divulge a transition into lead, copper, or other base metal. For example, Butte, Mont., was started as a silver camp, only to become a great copper producer when sinking on the narrow veins disclosed immense underlying deposits of the red metal.

The old camps, some of which are already effaced from the map while others are more or less down at the heels, are monuments to that picturesque figure, the prospector. He has now practically passed out of the picture in the West, and with his passing the section of the United States from the Rocky Mountains to the Pacific Coast has shown a continually declining gold production. No one can say that there are or are not undiscovered in that region mines as rich as those that have been found there in the past. Certain it is that they are no longer being sought as in the days of the pioneer. The old West owed much to the prospector. Without him its opening and development would have been greatly retarded, and the West of today might perhaps still be the West of yesterday.

THROUGHOUT the United States today people everywhere are much alike. They wear the same sort of clothes, eat the same brand of breakfast food, listen in on the same radio program, laugh at the same jokes. Seldom do we find types of people we can call truly distinctive.

Not so long ago this was not true. In its infancy, the West was a thing apart. Life, more in the rough, molded its own individuals and types. Among these, none was more colorful than the prospector, and none contributed more. His patience and perseverance fed our insatiable appetite for gold. He founded cities—virile cities that knew turmoil for a time and then, as the ore gave out, met lingering, inexorable deaths.

How some of these old mining camps came into being is here recounted. Back of them all was the spirit, the urge, the unrest that found expression in that adventurous, roving, care-free character—the prospector.

Much of romance attended the discovery of many of the camps that became known throughout the world. Luck, accident, and the unusual contributed their parts. Handicapped by his limited knowledge of geology and mineralogy, the prospector frequently failed to recognize valuable ore when he found it; and it sometimes happened that areas considered barren by virtue of fruitless inspection turned out to harbor bonanzas.

Until 1899 the desert stretches of southern Nevada had been condemned as devoid of mineral deposits. In that year "Big Jim" Butler walked into Klondike Wells lugging a bag of samples on his back. He insisted that the blackish rock he exhibited contained gold, but everybody laughed at him. They all knew that gold was found in light-colored quartz. Butler shouldered his sack and went to Belmont. He tried again to tell of the mountain of black stuff he had found out on the desert. He wanted a grubstake so that he could return to the spot and open up a mine, but his plea fell on deaf ears. Day after day he hung around the largest saloon in the town seeking to interest those who came

Ewing Galloway, New York

Top—"Shorty" Harris, pioneer of Panamint, demonstrates the use of the gold pan. This picture, taken by Philip Johnston, is published through the courtesy of "Touring Topics". Bottom—A group of old-timers panning for gold on the Sacramento River and near the spot where the first California gold discovery was made in 1849.

in. His bag of samples lay on the sand outside the door, and it became the habit of the townsmen to give it a kick as they passed in or out.

One day a rancher drove his buckboard into Belmont, and "Big Jim" found a listener to his tale. The rancher provided the necessary grub, and told Butler to go back into the desert and stake a claim for their joint ownership. The first ore he sent back to an assayer ran $500 in gold to the ton. The rock was black quartz. Thus the camp of Tonopah came into existence. In a few months Butler had taken a fortune from the ground. Heeding the pleadings of his wife, he sold his holdings and bought a farm in California.

In 1902, Harry Stimler, whom Butler had known in the Tonopah rush, asked him for a grubstake and got it. Stimler and his brother started out in a wagon to prospect on Columbia Mountain. Almost immediately they discovered mineralized outcroppings and sent samples back to Butler to be assayed. The samples showed high values in gold and, before the news became general, the Stimler Brothers and Butler had staked out the choicest claims. This was the site of Goldfield, which yielded the richest ore ever produced. A 48-ton shipment by the Mohawk Mine to a San Francisco smelter in 1907 netted $574,000 after all charges were deducted. Probably the next most valuable consignment was a 150-ton lot from the Cresson Mine at Cripple Creek in 1915. It netted $468,637.

Panamint, Nev., which bloomed only to wilt quickly, owed its discovery to banditry. A narrow, steeply walled canyon leading to the town furnished an admirable setting for the activities of a band of outlaws. They had an annoying and persistent habit of rising from behind boulders and, with leveled guns, relieving stagecoaches of the Wells-Fargo express boxes they carried. After a raid, the bandits retired to their stronghold—a cabin back in the hills and on a high point that commanded the approach from all directions. In their wanderings around the mountains, the outlaws discovered some rich silver lodes. They made no attempt to mine the ore, knowing that they would be arrested as soon as they appeared to buy the necessary machinery. They sold their claims to United States Senator William M. Stewart, of Nevada, and his associates. Stewart was able to gain for them as a part of the purchase price a promise of immunity from prosecution by the express company. After $1,000,000 in silver had been mined, the ore gave out. The operations showed a loss, due to the expenditure of a large sum for a smelter, at Panamint, to treat the ore.

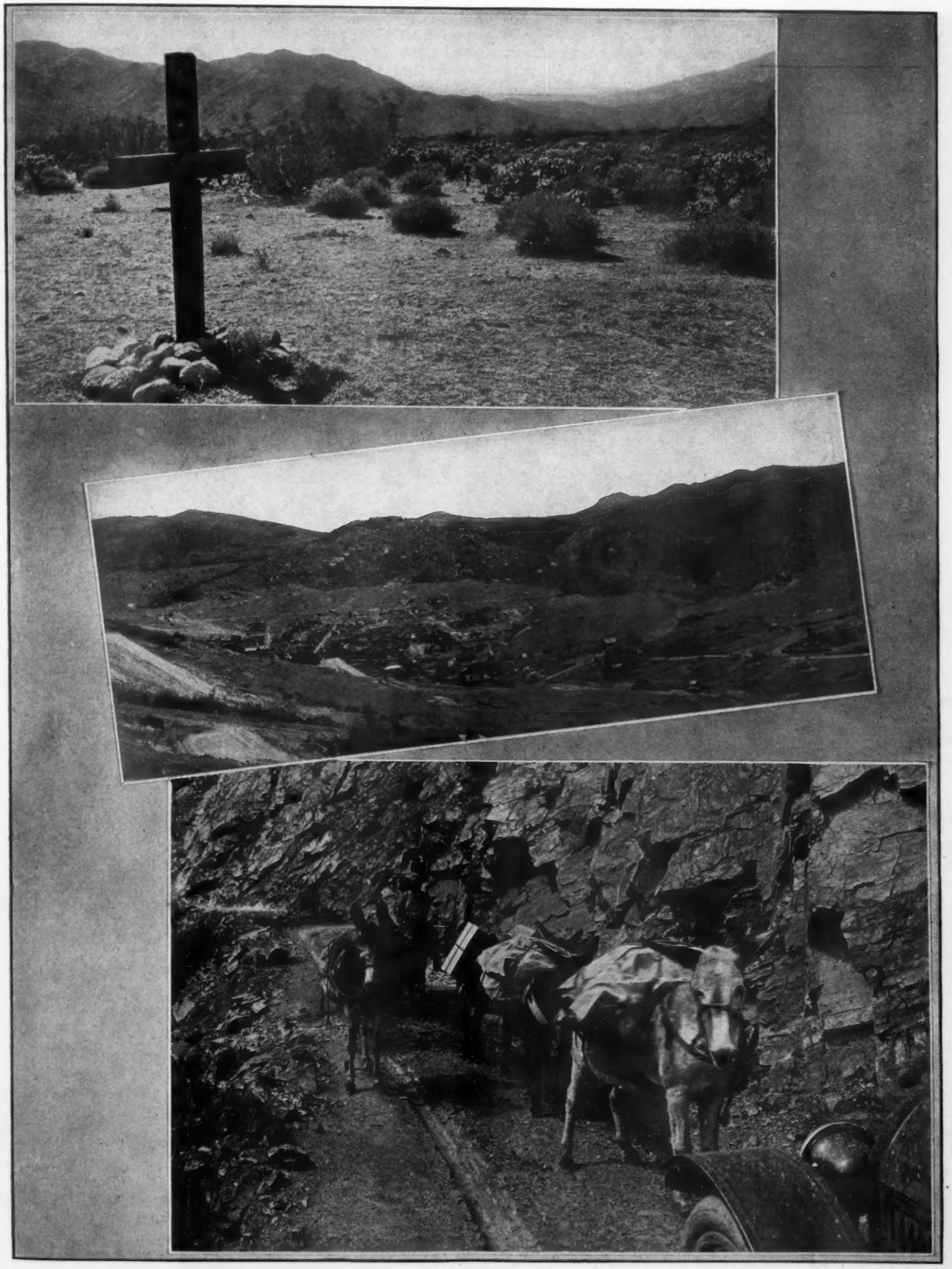
In his reminiscences, Stewart told how he outwitted the bandits who, having their money and immunity, waited around watching operations and planning to steal the bullion from the smelter as it passed down the narrow canyon to the outside world. Stewart divined what they were up to and hit upon the idea of pouring the metal into large molds, forming balls of silver weighing 750 pounds each. When they saw what was being done, the outlaws complained to Stewart that he was "taking a mean advantage of them." They held up the first load that went out, but found it impossible to make away with the "cannon balls." There was no place to drive the wagon except out to civilization or back into Panamint, so they finally mounted their horses and rode off in disgust. After that the silver was hauled out as ordinary freight, without a guard.

The discovery of the Caribou Mine, the greatest producer of silver in Colorado, was due indirectly to a hunting expedition and more directly to a man's good memory. While following an elk high up on the eastern face of the Continental Divide in 1860, Sam Conger, a prospector and hunter, noticed a number of pieces of float rock. From the weight of the rock he knew it to be mineral of some sort, but he had never seen anything similar to it and concluded that it was of no value. Eight years later he was waiting for a train at a small town in Nevada. A box of rich silver ore, shipped from the famous Comstock Mine, had fallen to the ground and broken open. Conger examined the ore and, upon being told what it was, exclaimed: "If that is silver ore, I know where there is plenty of it."

He returned to Colorado, took in five partners, and located claims covering the entire slope where the float lay. They found the vein and developed the mine that produced $5,000,000 worth of the precious metal. When President Grant, with his wife and their daughter Nellie, visited Colorado in 1873, a path of silver ingots was laid for them to

Ewing Galloway, New York

Hydraulic mining. The gold-bearing gravels are thus washed downstream to sluice boxes that catch the particles of metal.



Photos, Ewing Galloway and Colorado Association.

Top—Frustration. The grave of a prospector who never came back with his "pile". Center—Central City, the "Cradle of Colorado", as it looks today. Bottom—A prospector and his burro train dispute the right of way on a high road in the Colorado Rockies.

walk upon from their carriage to the Teller House, a hotel in Central City owned and operated by Henry M. Teller afterwards United States Senator from Colorado. Each bar was valued at $1,300. This metal came from the Caribou Mine, which was only a few miles away. A town of 4,000 grew up about the mine; but it was entirely destroyed by fire in 1879. It was never rebuilt. Today the Caribou is worked only by a few "leasers;" and the section is almost as deserted as when Conger hunted there for elk.

Creede, Colo., now almost decadent, but a contributor of $45,000,000 in gold, silver, and lead to the world's mineral supply, owed much of its affluence to chance. Mr. N. C. Creede, for whom the camp was named, discovered the first paying claim in 1889. He called it the Holy Moses, which were the first words he uttered upon picking up a rich piece of float rock. Two years later Theodore Renninger and Julius Haas, having been grubstaked by two butchers of the nearby town of Del Norte, prospected the area adjacent to Creede. With their food supply almost exhausted, and having found nothing, they decided to return home the following day. That night their burros strayed from camp, and in searching for them Renninger came upon a vein that looked promising. He named it the Last Chance. During the ensuing few years this mine produced one-third of the total output of Creede. Soon after work was started on the Last Chance, Creede visited the prospect and asked the owners to define the limits of their holdings. They did so, and he staked a claim next to theirs, calling it the Amethyst. It proved even richer than its neighbor.

Because they were unfamiliar with telluride ores, and looked in vain for quartz that bore free gold, armies of prospectors tramped over the site of Cripple Creek for 30 years before discovering the lodes that yielded millions. Attention was first directed to the area in 1874, when H. T. Wood, a member of Hayden's survey party, found gold float on the slopes of Mount Pisgah, a mile northwest of the present limits of the City of Cripple Creek. There was a rush of gold seekers; but they found nothing except a few additional pieces of detached surface ore. At Central City, Leadville, and elsewhere, the gold occurred in its free state, in placer gravels, or associated with quartz. At Cripple Creek, however, it was combined with the mineral tellurium to form the silver-white ores of calaverite, sylvanite, and petzite. These weathered to a dull, rusty brown that gave no evidence of the contained gold.

Ten years after the first excitement, a rumor that rich placers had been discovered in the Cripple Creek district precipitated a new rush, but again nothing was found and the region became thoroughly discredited among prospectors. The section was later given over to cattle raising—the Bennett and Myers ranch taking in a considerable portion of the mineral-bearing ground. Bob Womack, a cowboy, who had been at Central City in its early days, alternately worked on the ranch and prospected for several years. He uncovered several veins, but did not recognize that they were gold-bearing. At various times he took samples to Colorado Springs, but no one there displayed any interest in them. The cowboys and ranchmen considered his digging sheer foolishness, and he was therefore made the butt of much of their joking.

In December, 1890, E. M. de la Vergne and F. F. Frisbee prospected the region and had some specimens assayed. They showed values of $40 to the ton. Without Womack's knowledge they sampled his claim and found the supposedly worthless rock he was taking out to be worth $200 a ton. While they were negotiating with Womack for the sale of his prospect, Frisbee showed some of the float rock he had picked up to Winfield Scott Stratton, a Colorado Springs carpenter who had some knowledge of mineralogy. Taking his blowpipe outfit with him, Stratton ac-

Courtesy, Colorado Association

Telluride, in the scenic San Juan Mountains of Colorado, where many old mines are still operating.

companied Frisbee to the mountains. There he was shown some queer-looking rock by Dick Houghton, an old prospector who earned a living collecting specimens for museums. Houghton had carried the rock in his pocket, and it had been scratched by contact with keys so that Stratton, by the aid of a magnifying glass, could discern a metallic luster. Houghton thought the mineral was galena, the sulphide of lead. Stratton knew it was not galena and roasted a piece of it with his blowpipe, with the result that globules of gold stood out on it. Stratton then staked out a claim beside that from which Houghton had obtained the float, but could not find any of the rock in place.

producers in the district.

Many times, while wandering over the area, Stratton had passed an outcropping ledge of granite. A path connecting two ranches ran close to it, and hundreds of persons had traveled that way. The granite ledge showed no evidence of mineralization, nor even of quartz veins. Failing to find the source of the surface rock, Stratton returned to Colorado Springs and shortly thereafter, while speculating upon the whole matter, came to the sudden realization that, inasmuch as he had found gold-bearing rock all around the innocent-looking ledge, it must be the fountain head of the ore. He mounted a horse and rode to the spot. Breaking off several pieces

the district, and at one time it was possible to walk the entire six miles from Cripple Creek to Victor without setting foot off his ground.

The first step in prospecting a section for gold was to examine the gravels of gulches. If "colors" could be found by treating these in pans, arrastres, rockers, or other crude concentrating devices, the slopes above were explored in an effort to find the veins from which the particles of metal had come. This was a tedious job, but generally a fruitful one. Such methods led to the discovery of the Comstock Lode, in Nevada, the greatest single producing vein ever discovered in the United States. In tracing back the gravels of a river bed, the prospectors reached a point where

Courtesy, Colorado Association

Aspen, Colo., which was once a flourishing silver camp, is now little more than a memory.

A few days later, while prospecting on a ridge above Battle Mountain, Stratton descended into a ravine to get a drink of water from a brook. On his return up the slope he picked up several pieces of the now familiar float rock which he knew to contain gold. Calling to a companion, he set to work searching for the lode. Their efforts failed, whereupon they began digging trenches in the ground in the hope of uncovering the hidden source of the precious mineral. Later developments proved that these trenches ran parallel to the veins that later became the nucleus of the Vindicator Mine, one of the largest

of the granite, he gave them to a man who was just leaving for Colorado Springs to celebrate the Fourth of July and directed him to have them assayed. He then staked two claims and, because of the approaching event, called one the Independence and the other the Washington. The assays showed values of $300 to the ton. This was the beginning of the real Cripple Creek. The Independence became the most renowned mine in the camp. Stratton took millions from it, and in 1899 sold it to the Venture Corporation of London for $10,000,000. Stratton became a large owner of other mining properties in

three smaller streams converged. Two of these were followed back many miles without success. The third stream, however, led to an outcropping ledge of mineral that proved the key to the treasure chest that yielded $350,000,000 worth of gold.

Sometimes the source of the gold was covered and was found only after persistent search. Not infrequently years of patient endeavor failed to reveal it. The discovery of Leadville was delayed many months by the absence of surface showings of ore. Placer gold was found in California Gulch in 1860, but in a few years the gravels were worked out. By

Ewing Galloway, New York

Typical log buildings of an early western mine near Butte, Mont.

1875 only a few people remained in the section.

In 1874, W. H. Stevens, who was well versed in geology and mineralogy, persuaded some eastern capitalists to build a ditch and flume to carry water from the upper Arkansas River to California and Georgia gulches to facilitate the washing of gravels that had theretofore been inaccessible. Miners engaged in panning the gravels complained to Stevens of a black, heavy mineral that they were continually finding in their pans. Stevens analyzed some of it and found it to be carbonate of lead, rich in silver. In company with A. B. Wood, he sought and located some veins of it. They put a number of men to work, keeping them in ignorance of the nature and value of the ore. As there was no smelter at hand, the carbonate was thrown out on the dump. Everybody considered that Stevens and Wood were wasting their time; but when August R. Meyer started a small smelter, then they began to make money. Subsequently the ores proved rich enough to warrant shipping to St. Louis, where better smelting facilities were available. During the years immediately following, Leadville became an important silver camp, and afterwards a large producer of lead and zinc as well as of some gold and several other minerals of lesser importance.

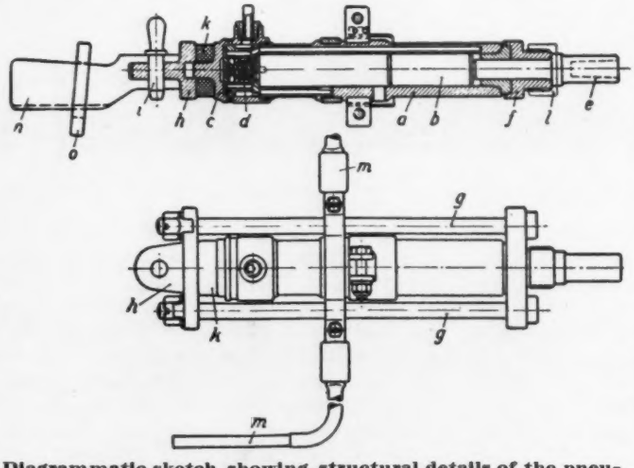
The froth-flotation process, which is used so extensively nowadays in the concentration of ores, is also being applied with success to the work of separating coal from ash-forming materials, that is, cleaning coal. According to the United States Bureau of Mines, the process, briefly, calls for the agitation of raw coal, one-tenth of an inch or finer in size, with from four to ten times its weight of water and with a small quantity of reagent, say from 0.5 pound to 5 pounds per ton of dry coal. The reagent, in combination with the agitating air, produces a froth which supports the coal, while the heavier ash-forming materials remain in the bulk of the water.

PNEUMATIC TAPPING HAMMER FOR BLAST FURNACES

THE work of tapping blast furnaces, as now commonly done, has been improved upon abroad, where a mechanical hammer has been developed for the purpose. This hammer, we are informed, is operated with compressed air, and is handled by two men—not necessarily skilled—who can by its aid drive a rod into the tap hole and withdraw it again in not more than five minutes, opening the tap hole completely in that interval. The same operation when done by hand normally requires from six to eight men and from fifteen to twenty minutes.

While the apparatus was primarily designed for this use, it can also be employed to advantage for withdrawing tuyeres and tuyere casings that have seized, slag tuyeres and their casings, etc. Then a special tuyere hook is substituted for the tapping rod. As the length of pull required for this work is very short, the hammer can be slung on a chain or wire rope at any convenient point above the operating platform. When utilized for tap-hole piercing, the machine, which weighs nearly 300 pounds, is suspended from a roller moving on a rail paralleling the runner for the molten metal and about 13 feet above it. The overhead rail is 16 feet long and can be swung aside quickly when the hammer has finished its work.

After the rod has been driven into the tap hole to the desired depth, the hammer is released; its percussion piece is detached; the bore of the cylinder head is sealed with a cover; and the hammer is swung through an angle of 180°. But before it is ready to withdraw the tapping rod, it must be fastened rigidly to the rod, and this is done by means of a cotter, ring, and pin. With the machine in that position, the piston works in the reverse order and exerts sufficient pulling power to get the rod out of the hole.



Diagrammatic sketch showing structural details of the pneumatic tapping hammer. A, cylinder; b, piston; c, valve gear; d, spring casing; e, percussion piece; f, cylinder cover; g, tension bolts; h, crosshead with coupling lug; i, pin; k, rubber cushion; l, cover for cylinder; m, two detachable bellcrank levers to guide the hammer; n, cotter; and o, ring.

FACTS SOUGHT ON HOW BEST TO INSULATE THE HOME

HOW best to insulate homes of moderate size so that their occupants may be well protected against heat in summer and cold in winter has been made the subject of exhaustive study in England. For the purpose, a special house has been built at Garston, and in it has been placed apparatus that record, under conditions likely to exist in the average small dwelling, the effect on its interior of sunshine on the roof, of air penetrating the walls, of flues, ventilators, etc.

The several recording instruments respond to slight atmospheric changes and at the same time are made, by the aid of relays, to operate electric heaters—the heaters being required to maintain a uniform temperature within the structure. It has already been determined that winds approaching a velocity of 15 miles an hour will cause a steady stream of air to flow through a 9-inch brick wall at the rate of 8.5 cubic inches per square foot of surface per hour. The outcome of these tests should be of considerable interest to the prospective housebuilder, as a well-insulated home will do much to keep him comfortable the year round while measurably cutting down his coal bill.

Two Diesel-engined floating cranes, each with a lifting capacity of 25 tons, have latterly made their appearance in the Harbor of Hamburg. Each craft has an overall length of 85.3 feet, a beam of 49.2 feet, and a draft of about 5 feet; has twin screws driven by two Diesel engines; and is capable of making a maximum speed of 6 knots an hour.

Compressed Air Put to Novel Service by Alabama Power Company

Intake Gates Kept Free of Floating Trash by an Effective Pneumatic System

By R. G. SKERRETT

ALABAMA'S amazing industrial development during the last ten years is in the main due to the fact that the State has at its disposal an abundance of electrical energy drawn from certain of her rivers and from great steam plants strategically located close to the mouths of nearby coal mines. This fortunate state of affairs is the consequence of the ceaseless efforts and enterprise of the Alabama Power Company—the largest of Alabama's corporations and the greatest producer of electricity in the South today.

The Alabama Power Company has reached its present eminence because of the vision and the well-directed efforts of the men that have successively borne the burden of guiding the corporation during the years of its development. Step by step they built and coördinated until they brought into being the existing system which ranks sixth among those created by American concerns that generate energy from the nation's falling waters.

The transmission and the distribution lines of the company have a combined length of 6,352 miles; and over this network of cables and wires is dispatched current ranging in power from the modest voltage permissible for domestic use to the tremendous energy of 154,000 volts. This current now goes to more than 96,000 electric consumers in contrast with the 5,305 customers registered on the company's books at the end of 1915. At that time, the connected load totaled but 62,000 hp., while today it reaches 938,250 hp.—more than fifteen times the connected load carried a decade and a half ago! Probably no small part of this demand growth is attributable to the fact that Alabama is authoritatively said to have one of the lowest electric rates in the country.

Interesting as it would be to describe both the steam and the hydro-electric plants of the Alabama Power Company, we must, however, limit ourselves to the water-power developments, because the climax of the story we wish to tell is how compressed air is utilized to facilitate operating the hydro-electric stations when some seasonal conditions might otherwise hamper them. The company has in active service five splendid hydro-electric plants; and is due to have ready early in the current year a sixth plant that is designed to have an ultimate capacity of 108,000 hp. The five stations now working have a combined installed capacity of 513,800 hp. If we add to this the capacity of the company's fuel electric plants and certain large blocks of purchased current, the total generating capacity available reaches 942,045 hp.! No wonder Alabama is forging forward industrially at the rate she is; and the people of the State are no doubt alive to the part the Alabama Power Company has been playing in their progress and their prosperity.

Two rivers, the Coosa and the Tallapoosa in central Alabama, have been harnessed by the interposing of three dams on each of those streams at points where the heads provided naturally by the falling waters could be utilized not only for power purposes but to conserve and to measurably control their flows in flood periods, thereby turning to helpful account rainfalls that might, if unchecked, be dissipated more or less disastrously.

The first dam to be built was begun in 1912 and completed two years later. This structure, then designated as Lock 12 Dam, has recently been named Lay Dam, in recognition of the pioneer labors of Capt. William Patrick Lay, organizer and first president of the Alabama Power Company. That dam started the company on its splendid career of public service. The dam is located on the Coosa River; and many eminent engineers had to do with its designing and its rearing. In the associate power house are turbines capable of developing 110,000 hp. It is interesting to recall that, when that dam and generating station were ready for service, the Alabama Power Company was hard put to it to find customers to whom it could dispose of any considerable measure of the plant's output.

There came a time, about five years later, when the Alabama Power Company realized

Airplane view of a populous section of Birmingham, Ala., "The Magic City", giving visible evidence of what power has contributed to the development of that enterprising metropolis of the South.

that there was a market for more power than could be produced at the Lay Dam, and, accordingly, in 1920, another dam—Mitchell Dam—was begun on the Coosa River below the Lay Dam. That second generating station was completed in 1923, with an installed capacity of 72,000 hp. The year the Mitchell Dam station was put in service, the Martin Dam development was started; and before the close of 1926 that great undertaking was operating. The Martin Dam is on the Tallapoosa River; and the crest of the dam is 150 feet above the river bed. In the power house there are three units each of 45,000 hp., and the plan is ultimately to install a fourth unit which will raise the generating capacity to 180,000 hp.

The Martin Dam creates what is known as Martin Lake—a reservoir capable of impounding 60,000,000,000 cubic feet of usable water. The dam backs up the water of the Tallapoosa for a distance of 32 miles; and the lake so formed has an area of 40,000 acres. At one point, the lake is nineteen miles wide. This enormous reservoir permits the turbines in the Martin Dam power house to run at a maximum capacity throughout the dry periods of a year and conserves much of the runoff of the tributary watershed during the rainy seasons.

An especially interesting feature of Martin Dam is the stilling pool formed by an auxiliary dam 22 feet high. Twelve spillway gates, each 18x30 feet, discharge into this basin, where the energy of the waste water is dissipated. Should an exceptional flood occur when the lake is full, eight additional gates may be opened so as to discharge water below the auxiliary dam. This water, directed at right angles to the water coming over the auxiliary dam, creates a second water cushion which subdues the force of that flow through internal friction. Consequently, flood waters that might be destructive flow quietly away instead of scouring out the river channel below the dam and imperiling that structure's foundation.

The year 1926 was made further memorable in the history of the Alabama Power Company by the starting of work on the Upper Tallassee Dam, also on the Tallapoosa, and on the Jordan Dam, the third power house on the Coosa River. The generators at the Upper Tallassee development were put in service on July 1, 1928; and the two dynamos installed have a combined output of 50,000 hp. A third unit will be provided later that will raise the capacity of the plant to 75,000 hp. The turbines at the Jordan Dam began sending current over the lines on January 1, 1929; and the present generating capacity is 146,800 hp. When a fourth unit is in place, the station will be capable of producing 220,200 hp. In short, it will be the largest of the company's hydro-electric power plants.

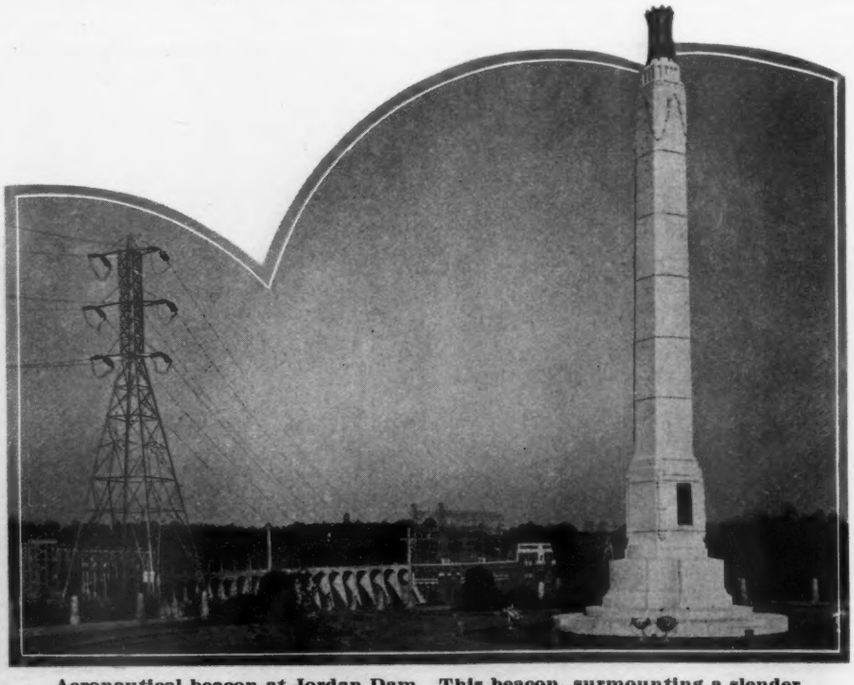
Alabama Power Company's fine office building in Birmingham.

The Lower Tallassee development, on the Tallapoosa River, was commenced in April of 1928, and will probably be ready to generate current in the spring of this year. The project has called for the raising of the present 60-foot dam to a height of 90 feet and for the construction of a new power house with an initial installation of two units, each of 36,000 hp. It is planned to provide a third unit later, and this will increase the generating capacity to 108,000 hp. The Upper Tallassee and the Lower Tallassee developments, together with the station at Martin Dam, will be able to make the fullest use of the water stored in Lake Martin; and the regulated flow of the Tallapoosa River will thus be utilized under a total head of 293 feet. That is to say, the water will be used successively to drive the turbines in the three plants; and this arrangement will prove especially valuable in the dry seasons when "run-of-river" plants cannot be operated at capacity.

The Alabama Power Company mentioned in its annual report for 1928—the latest one available—that nineteen major industries were located that year in the State and in communities served by the company. Those industries represent a capital investment of more than $35,000,000 and employ a total of 8,500 people. Apart from these major industries supplied with power by the company's far-flung network of lines, there are the lesser beneficiaries of the system in the form of business buildings, stores, places of amusement, and homes. Furthermore, the Alabama Power Company is doing its utmost to carry current to rural districts; and at the present time electricity is being delivered to such consumers over rural lines having a combined length of more than 1,000 miles.

Today, Alabama is first among the states in the output of cast-iron pipe, and first in brown ore, third in red hematite ore, and third in total ores mined. Alabama also ranks fourth in the production of coke and pig iron, fifth in coal mined, fifth in steel manufacture, and eighth in the making of cement. In fabricating iron and steel products, including bridge and car-building, Alabama leads the South. There are many other diversified forms of industry in which the State stands forth conspicuously. These facts are mentioned merely that we can understand what an abundance of available power is doing towards enabling the State to make the most of her natural resources and the advantages of her geographical position.

It should be self-evident that the industries within the State as well as other Alabama consumers of electric current would be seriously handicapped or more or less incommoded or inconvenienced if any of the hydro-electric stations should fail to deliver current to the transporting and distributing lines. Therefore, it is essential that the hydro-electric plants should be able to carry their respective assigned



Aeronautical beacon at Jordan Dam. This beacon, surmounting a slender commemorative granite shaft, is visible under favorable conditions to airmen at a distance of 50 miles.

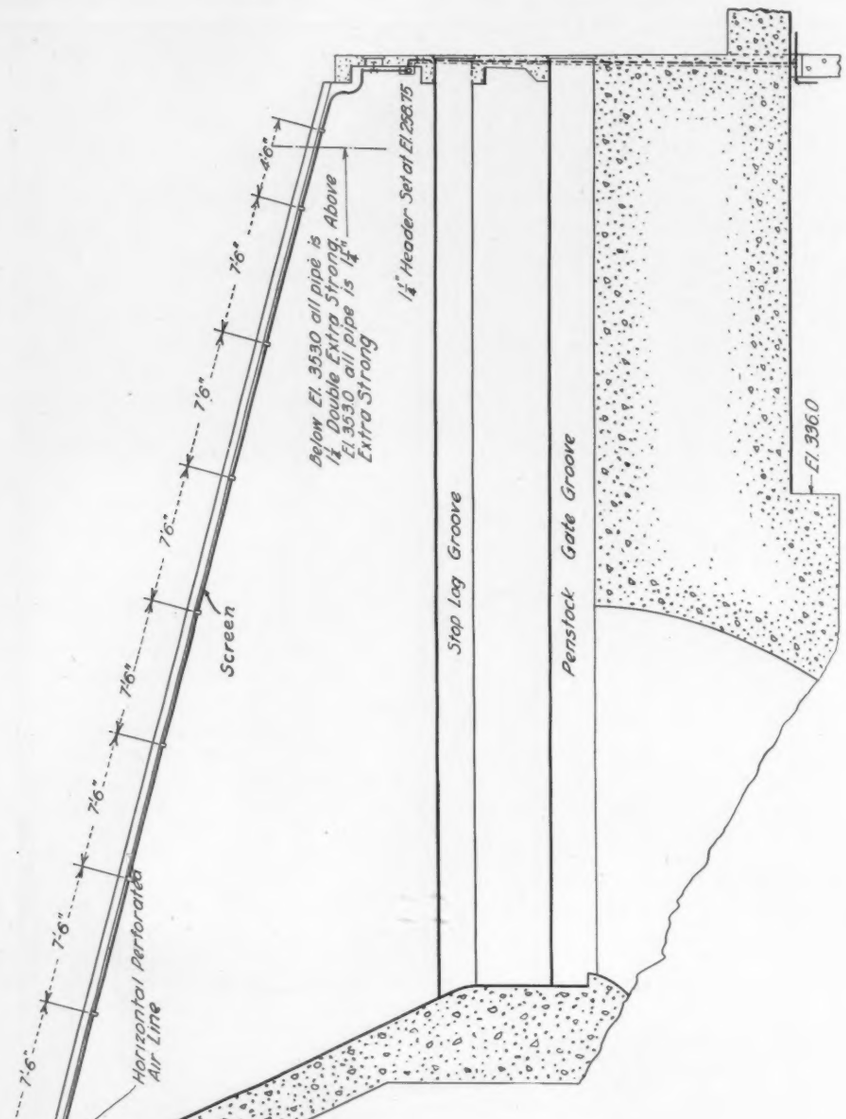
1—Lay Dam, formerly known as Lock 12 Dam, on the Coosa River.

2—Mitchell Dam, also on the Coosa River.

3—Martin Dam development on the Tallapoosa River. The dam creates a lake having an area of 40,000 acres.

4—Upper Tallassee development on the Tallapoosa. The plant will have an ultimate capacity of 75,000 hp.

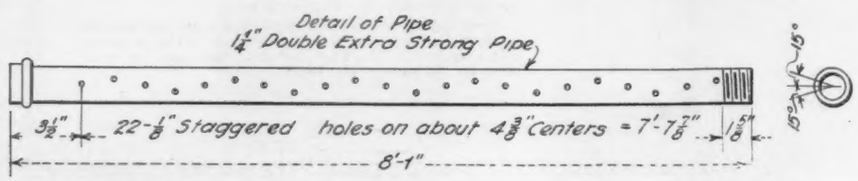
5—Jordan Dam and associate power house on the Coosa River. This plant, with a present capacity of 146,800 hp., was put in service in January of 1929.



Vertical section of the intake screen and compressed-air trash-clearing equipment at Mitchell Dam.

loads day in and day out. This they could not do if the water at any of the dams were obstructed in its course to the turbines. Provision has therefore been made to prevent occurrences of this sort; and this brings us to an interesting and generally unfamiliar use of compressed air at the different dams of the Alabama Power Company's hydro-electric system.

The Coosa and the Tallapoosa draw their waters from thickly timbered areas in which extensive logging operations are conducted. As a consequence, flood-water periods sweep into the tributary streams and into the rivers, themselves, great quantities of chips, branches, and even stray logs. Some of these are immediately borne seaward, while others linger so long in their journeys toward the ocean that they become more or less water-logged. In the latter condition such trash is particularly troublesome because it travels low in the water and cannot be seen. It is this refuse that would inevitably clog the intake screens if steps were not taken to clear the stuff away. Of course, the penstock gates could be closed, the turbines shut down, and the trash removed laboriously with suitable equipment; but this would entail a loss in generating capacity, and, furthermore, the need of such an operation might occur at the peak-load period of service. How to avoid these drawbacks constituted a problem that was happily solved by a simple, but withal ingenious, employment of compressed air. The Alabama Power Company utilizes this trash-clearing method at its several hydro-electric plants—varying the installations agreeably to local conditions. We shall, therefore, describe but one of them, inasmuch as the working principle is the same for them all.



Details of a section of perforated bronze piping from which compressed air is discharged to blow away trash at an intake gate.

The accompanying drawings illustrate how the intake screens at the Mitchell Dam are kept clear of partly water-logged trash. At Mitchell Dam there are several submerged intake gates; and each intake screen is provided with an air installation for rack cleaning. The air is led down from a header along each side of an intake, and then the piping is run horizontally along the bottom of the intake to the middle of the rack. At that point each half section of horizontal piping is closed with a cap; and each half section can be operated independently if so desired. A staggered line of holes, ⅛ inch in diameter and 4⅜ inches between centers, perforates the upper surface of the piping, and it is from these outlets that air is discharged at 125 pounds pressure. All this piping is now of bronze to avoid rusting, which occurred at first when steel pipe was used. The air line is made up of 1¼-inch extra-strong piping. As can be seen by the drawing, all piping lies within the vertical bars forming the screen racks.

The engineers have found that the compressed air, mounting surfaceward, exerts sufficient force to carry upward with it partly water-logged trash and to sweep away even good-sized logs. The installation has proved especially valuable in scattering trash carried to the intakes after heavy rains. It should be mentioned that the flow of water into the penstocks is purposely reduced and even momentarily stopped while the pneumatic clearing system is in action. If this were not done, the velocity of the inflowing water would impair the effectiveness of the air jets. This defense against accumulating trash was first employed by the Alabama Power Company at the Mitchell Dam, and, when it proved successful, the company's other hydro-electric plants were similarly equipped.

Each dam is provided with a compressor plant of sufficient capacity to meet the requirements of the trash-clearing installation; and the demand for air naturally varies with the size and the number of the intakes. In some cases two compressors are available—one being enough to meet average conditions while the other serves either as a standby or a means of furnishing air for unusually troublesome conditions. The subject of keeping in-

Lower Tallassee development, on the Tallapoosa River, which will be operating this spring. The installed turbines will have a combined capacity of 72,000 hp. Ultimately, the plant will develop 108,000 hp.

take grids free from obstructions is an interesting one; and in this application of compressed air we have the solution of a problem that may reveal data of value to a considerable number of our readers and suggest ways in which their own kindred difficulties may be disposed of.

NEW QUARRY CAR WITH A DOUBLE DUMP BODY

THE Easton Car & Construction Company, of Easton, Penn., manufacturers of a wide variety of industrial cars for quarry, mine, and plant use, has put on the market a car much larger than any heretofore built by it and of railroad classification. The "Duplex Phoenix", as its names implies, has mounted on its standard-gage trucks two dump bodies having a combined capacity of 20 cubic yards or approximately 80,000 pounds. The trucks are equipped with full-size automatic couplers with friction draft gear, and are provided with Westinghouse air brakes. In fact the cars, of patented design, conform in every way to American Railway Association practice and meet the Government's safety-appliance requirements.

According to the manufacturer, the new type of car is admirably suited for work in any open-pit mine or quarry where loading is done by steam shovel. Further, by making use of two short dump bodies instead of one long one it is possible to spot each unit at the point of discharge so as to place the load right on feeders, etc. The dumping is done either by means of electric or air hoist operated by remote control. Cars of this type are already in use in a Michigan open-pit iron mine where they are working in conjunction with a 2½-yard shovel and handling pieces of ore weighing as much as 2 tons each.

With the opening of the new entrance lock to Tilbury Docks, the Port of London can now accommodate the largest liners afloat.

AIRPLANES REFUELED WITH COMPRESSED AIR

PORTABLE compressor renders excellent service in the work of refueling airplanes! That is the newest use, to our knowledge, to which this type of ever-ready power plant has of late been put—a use that has speeded up the turn-round of aircraft by more than an hour and a half. In other words, with compressed air, a plane can be got ready again for departure, as far as refueling is concerned, in twenty minutes instead of in two hours—the time formerly required, according to the Pan-American Airways, Inc., to fill the gasoline tanks of one of their large machines that carry mail, express matter, and passengers from Miami and Key West to points in the West Indies, Mexico, Central America, and the Panama Canal Zone.

At the corporation's Cristobal base, in the Canal Zone, there is a 4¾x4-inch Type 20 portable that has been provided primarily for the purpose of supplying air for refueling. The only other equipment needed is a piece of ¾-inch pipe, long enough to reach from the top to within a short distance of the bottom of a barrel of gasoline, and two lengths of flexible air hose—one extending from the compressor to an opening in the barrel top and the other from the pipe outlet to the airplane tank to be charged.

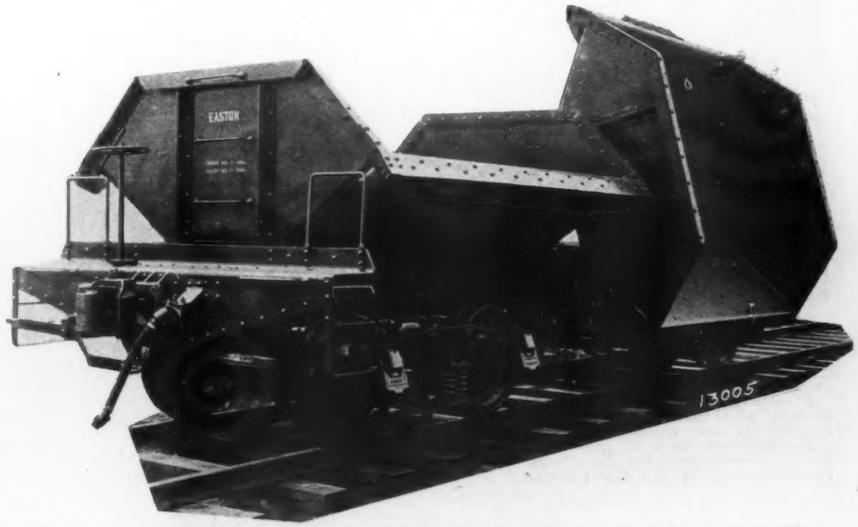
When a machine arrives, the outfit can be quickly brought alongside, the pipe and hose connections made, and the compressor started. Almost in less time than it takes to tell it, air begins to flow into the barrel; and the pressure thus exerted upon the free surface of the fluid forces it up through the central pipe and the hose into the tank.

This system of refueling lends itself especially well to airplane service not only because of the saving in time—an important item in a system of transportation that is based essentially upon speed—but also because the transfer of the highly volatile fuel can be effected without danger of explosion.

COOKING WITH ELECTRICITY IN A NEW WAY

GERMANY is responsible for a new method of cooking, for there, we are informed, originated the idea of preparing food for the table by electrocuting it, so to speak. It has been proved that it is feasible to cook a potato, for example, by inserting two electrodes at opposite points in the tuber and then passing a current through it.

With this suggestion as a guide, the Iowa State College tried out the scheme and, apparently, with success. The investigators found that they could roast meat, boil vegetables, in fact, cook any kind of food by placing it in a glass jar containing the necessary electrodes—in this case a steel disk at the bottom and a steel-plated plunger inside the cover. It sounds practical and simple enough, because the use of a stove, as such, is dispensed with; but, "being from Missouri", we've got to taste to be convinced.



The new standard-gage quarry car showing one of its 10-cubic-yard bodies in unloading position.

Marble Quarrying in Northern France

By THE STAFF

MARBLE quarrying is an industry that dates back to earliest times—the stone, because of its luster, markings, and range of color, always having been favored for special architectural, decorative, and sculptural purposes. Today, the vogue for marble is greater than it has ever been in the past, because this is an age of color—color everywhere to please the eye. Where it was once employed modestly for ornamentation, architects now use it lavishly both inside and outside of structures of many sorts. Entire skyscrapers, representing thousands of square feet of surface, are being faced with this stone of which, fortunately, there is an enormous reserve available to satisfy the present large world demand for blocks and slabs of many hues and of a variety of sizes and shapes to suit different tastes and requirements.

Previously, in this Magazine, we have described how certain marble quarries in the United States and in Europe get out the stone and handle the massive blocks; and now we are fortunate enough to be able to reproduce some excellent photographs of several old-established French workings that have been taken over by the Société des Carrières de la Vallée Heureuse & du Haut Banc and to tell something about the methods employed there.

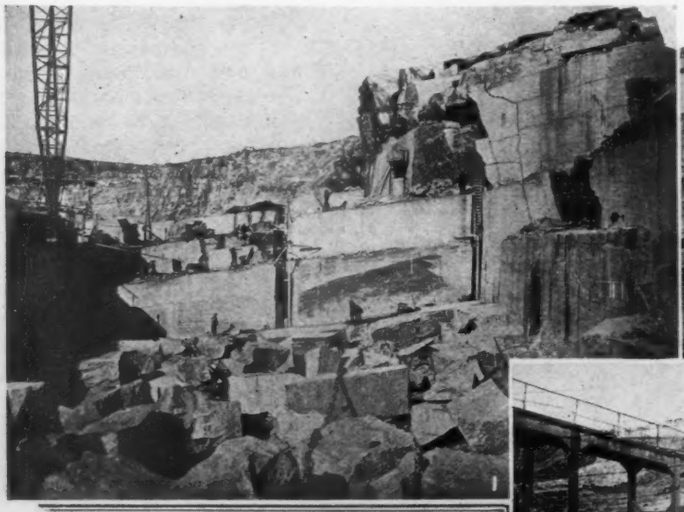
The company was organized in 1905, and controls three quarries—the Vallée-Heureuse, the Basse-Normandie, and the Haut-Banc—which are grouped around Hydrequent-Rinxent situated in the northernmost part of France and within easy reach by rail of the channel ports of Calais and Boulogne. Combined, the quarries cover an area totaling 10,763,870 square feet; they have an aggregate working face nearly 1¼ miles long; and are at an elevation of 131 feet.

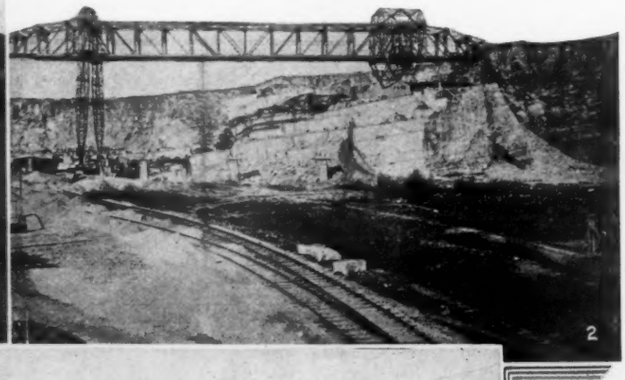
The marble produced is of a high grade that has found a wide field of application both at home and abroad. It is sold under the names of "Lunel Clair" and "Lunel Fleuri"; and lends itself especially well to decorative uses because of its soft, pinkish-gray tints. Some of it has beautiful, floral-like markings, hence the appellation *fleuri*.

The Vallée-Heureuse quarry is the largest of the three, and we will therefore confine ourselves mainly to this plant. There, great blocks of marble—about 50 feet long, from 13 to 26 feet high, and from 4 to 6½ feet wide—are broken free from the expansive face by the use of numerous air-operated "Jackhamers" and wire saws. These saws make the vertical cuts, and consist essentially of lengths of wire rope, usually ¼ inch in diameter, each of which is guided downward on tension posts firmly fixed in the ground and suitably fitted with pulleys over which the cable travels. As the wire must be much longer than the cut to be made with it, it can perhaps be appreciated why the eight wire saws that do this work are 32,808 feet long—more than 6 miles. Wire saws are likewise utilized to cut the dimension stone into slabs, as shown in one of the accompanying illustrations. These, with their 13,123 feet of wire, bring the total length of the cutting cables up to 8½ miles. With the vertical cuts made, the blocks are broken free by the plug-and-feather method—the "Jackhamers" drilling the necessary horizontal holes.

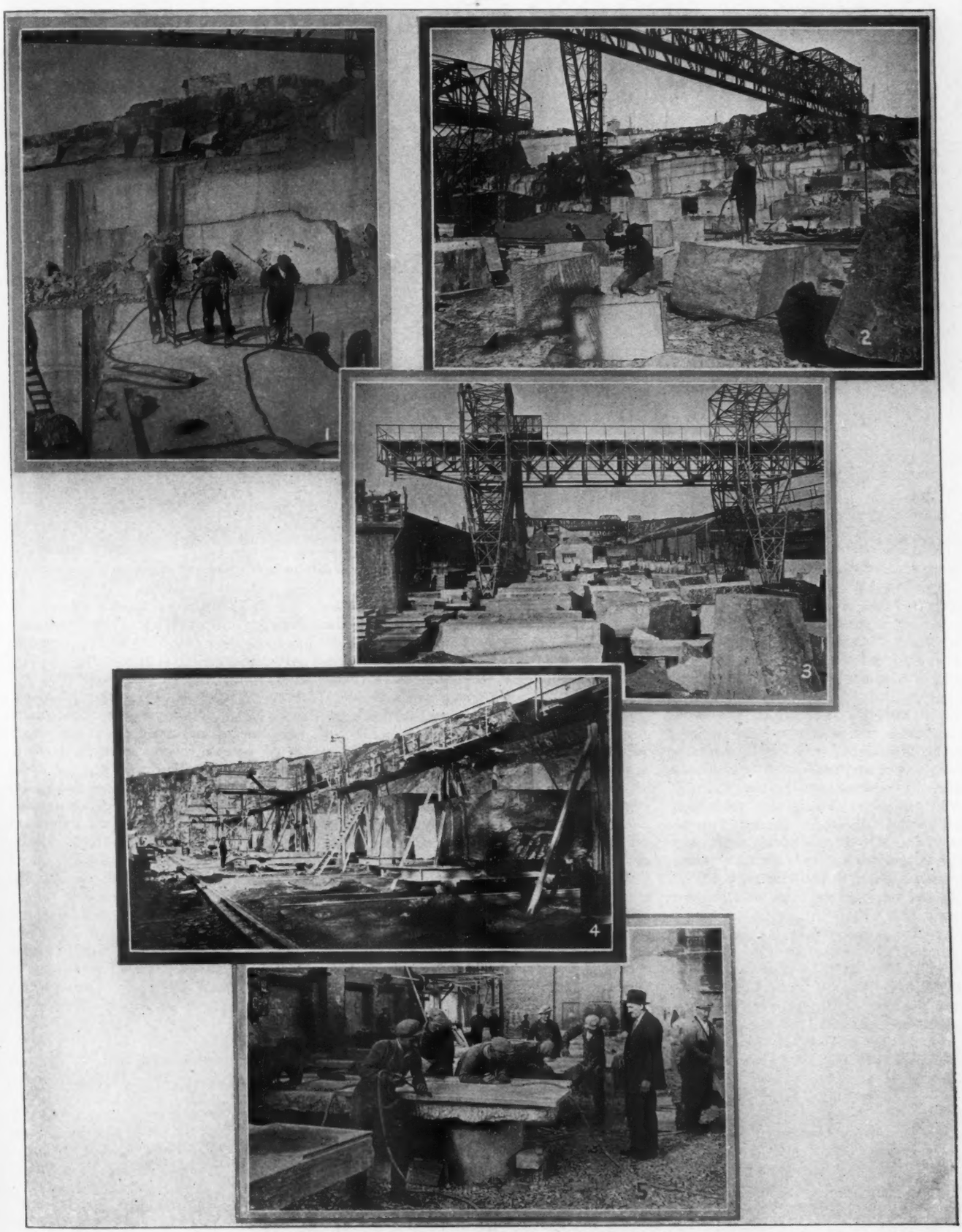
Before the heavy pieces of marble can be transported they must be split into sizes that can be conveniently handled, and this is also done by the use of plugs and feathers. At the quarry face all the lifting is done by an electrically operated gantry that has a reach of 400 feet and a maximum carrying capacity of 75 tons. By means of this traveling crane the separate blocks are placed on low, flat trucks, and these, with their loads, are run under the wire saws which cut the blocks into slabs of any desired thickness. There, another but smaller gantry takes the slabs and puts them on cars for removal to the cutting shed. This is a large and commodious structure which is well equipped with pneumatic tools that do much of the work of finishing. Compressed air is supplied at all three quarries by seven Ingersoll-Rand compressors.

In getting out the stone and finishing it for the market, the company produces annually something like 500,000 tons of waste material. There is a ready sale for this rock, which is broken up and used variously as rubble, ballast, flux, etc.



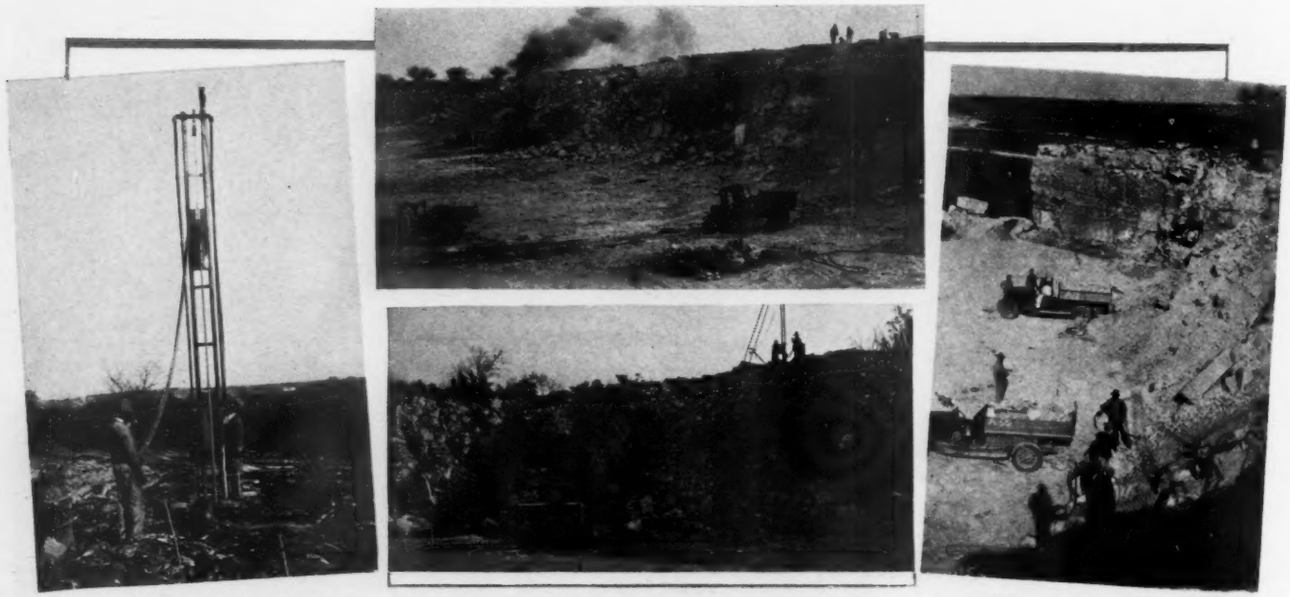


1—Wire saw set-up at one of the marble quarries. These saws are used to make the vertical cuts in getting out the stone.
2—The great gantry at the Vallee-Heureuse quarry that handles the massive blocks of marble at the working face.
3—General view of the Basse-Normandie quarry of the Societe des Carrieres de la Vallee Heureuse & du Haut Banc.



1—Splitting large blocks of marble by the plug-and-feather method. "Jackhamers" are being used to drill the necessary holes. 2—Sizing and shaping blocks preparatory to cutting them into slabs. 3—Storage yard at the Vallee-Heureuse quarry where large quantities of the stone are held ready for further treatment. 4—Group of wire saws that cut the blocks into slabs of any desired thickness. 5—Corner of the commodious cutting shed where air-operated tools are used for various finishing purposes.

Quarrying 300,000 Cubic Yards of Stone a Year with One Rock Drill



At the left is shown the X-71 drill at work on a 24-foot hole. The other three views depict various phases of the quarry operations.

THE City of San Antonio, Tex., is fortunate in having a rock quarry on municipally owned ground within its corporate limits. From this quarry, which adjoins Brackenridge Park, is secured rock for concrete aggregate, for the sub-base of asphalt pavement, and for a variety of other purposes.

The rock is a limestone which carries a rather high content of shale. It is essentially a cement rock, and is likewise used as raw material by two nearby Portland cement plants. Its composition is such that when broken up and subjected to pressure it tends to consolidate. It therefore finds wide usage for driveways, walks, and the like, where traffic packs it into a well-knit mass with a smooth and even surface. It is of a pleasing buff color.

The quarry is operated by the city, and is producing about 25,000 cubic yards of stone per month. The material lies in almost horizontally disposed strata, seldom more than a foot or two beneath the surface. The overlying mantle of soil is stripped away by hand shoveling. At the time the quarry was opened, the site was in the form of a gently sloping hill. Work was begun at the base and has been carried progressively into the hillside. As the floor is kept horizontal, this means that the depth of the cut increases, leaving a working face that grows in height as successive sections are shot down and removed. When the opening has attained a sufficient area, a second cut will be made below the present floor.

An interesting point in connection with the operations is the fact that one rock drill suffices to make the holes for blasting down the quarry's entire output. An average of 120 trucks are kept busy hauling away the material; and three steam shovels and some hand labor are required to load the rock into these 1½-yard trucks.

The machine just referred to is an Ingersoll-Rand X-71, a drifter-type of drill which is frequently employed for vertical work because of its great power and its ability to put down holes to a considerable depth in stubborn ground. It is set up on a wagon mounting, with a hand-operated hoist for raising and lowering the slab-back that carries the drill. The entire assembly is supported on skids, and is readily movable with the aid of bars from one location to another. The drill is operated by a crew of two Mexicans.

Holes are put down at 15-foot intervals on a line parallel to the quarry face. The distance of this line back from the face varies, but is normally around 10 to 12 feet. Drilling is done wet, the water being fed through the hollow drill steel. But instead of discharging through the center of the bit at the bottom of the hole, the stream passes out through a hole in the side of the steel and about 2 inches above the points of the bit. This modification of the usual system was necessary because the material drilled had a tendency to plug up the bottom hole in the steel. At the time the quarry was visited, the holes were being put down 24 feet. This was accomplished with two steels to a hole, the first length drilling to a depth of 12 feet and the second completing the hole.

Because of its nearness to the surface, the rock is somewhat fractured—blasting serving to crack and to fracture it more. The broken-up area extends for a considerable distance back from the face and makes drilling extremely difficult. Trouble is caused by the jamming of the drill steel in the loose material. In spots the rock has a high clay content, and this also complicates matters. For these reasons drilling progress varies from time to time. As many as ten holes, 24 feet deep, have been put down in a day. On the other hand, some days have shown a net result of but one hole completed because it was not possible to carry the other holes that were started down to the prescribed depth. In spite of the unfavorable conditions, the average maintained is high enough to keep drilling progress well ahead of the demands for rock. Between changes of steel the hole is filled with water and then blown clean with air introduced through a small-diameter pipe.

Compressed air for the X-71 drill is furnished by a 10x8-inch Type 20 portable. The holes are sprung with dynamite, and then each is loaded with from six to eight kegs of black powder. Ordinarily three holes are shot at a time. Heavier blasting is prohibited by reason of the proximity of homes and other structures.

On the floor of the quarry, "Jackhamer" drills are used for pop-holing large boulders and for drilling toe holes wherever they are required to break out portions of the floor not cleanly sheared off by the black-powder blasts. Three of these hand-held drills are on the job, although all are seldom needed at one time. Two of them are of the BCR-430 type, and the third is an R-39. These drills get their air supply from a 7x6-inch portable compressor. At the present rate of work, the quarry will supply the needs of the City of San Antonio for stone for about four years.

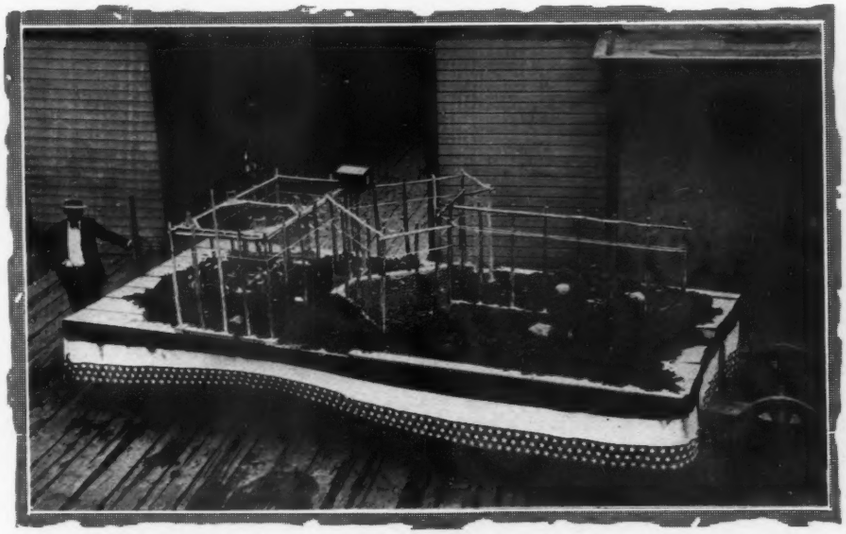
Riches from Alaska's Teeming Waters

Catches of Salmon and Halibut Valued Annually at Many Millions of Dollars

By S. G. ROBERTS

YES, this is a fish tale. And we might as well admit at the very start that we are going to deal in measures that run even into hundreds of millions. In short, our tale has to do with vast quantities and with amazing values; but the verity of these figures is vouched for by Government records.

The story we have to tell concerns virtually all of us, because it describes phases of those fisheries in Alaska that provide us with the toothsome salmon and the appetizing halibut that are eaten throughout the length and the breadth of our country. According to the latest statistics available—those issued by the United States Bureau of Fisheries for 1928—the salmon catch for that year totaled 517,069,403 pounds; and the market value of those fish was put at $47,480,478! During the same period the halibut catch amounted to 35,357,474 pounds; and 90 per cent of that catch, when marketed, had an estimated value of $3,101,716. Even the least of the sums mentioned has splendid proportions.

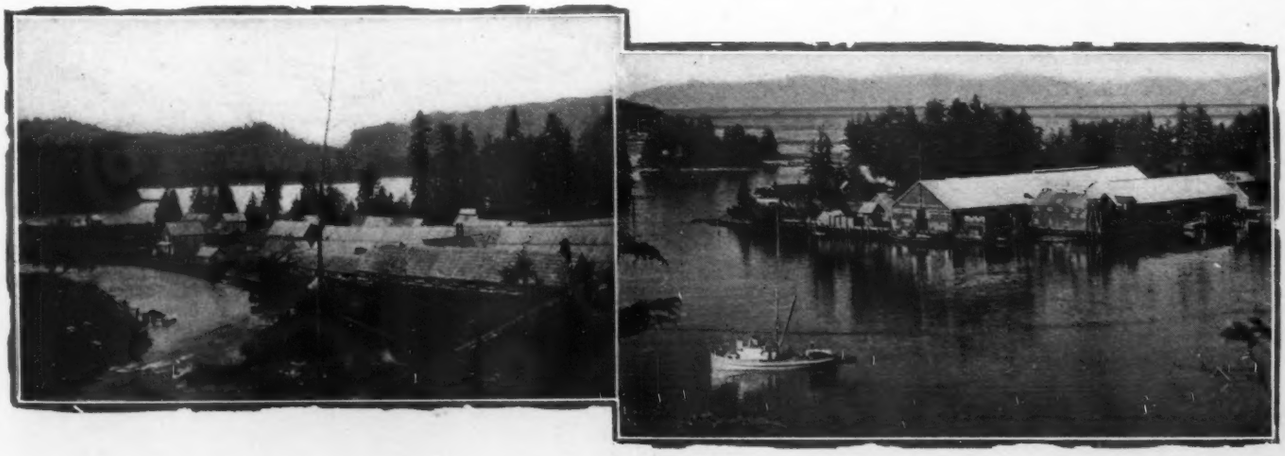


Model of standing trap as used in southeastern Alaska and demonstrated by the Sunrise Cannery in Ketchikan.

Apart from the dietary and the monetary significance of these aquatic foodstuffs gathered from the waters of Alaska in the course of a single year, is the contrasting fact that we paid Russia, in 1867, only $7,200,000 for that expansive region of incalculable natural riches. But this treasure house was in a fair way to be stripped of the greatest of its finny wealth through overfishing that interfered with the reproductive balance previously maintained by the several species of salmon against their natural enemies—such as bears, gulls, trout, and other wild creatures that preyed upon them. Thanks to Congress and to the well-directed and persistent efforts of the United States Bureau of Fisheries—especially since 1924, a sufficient percentage of the salmon returning from the sea has been permitted to reach the spawning grounds so as to start the replenishment of many of the streams that had once yielded salmon in abundance but which had become greatly if not gravely depleted. This situation was the outcome of the ever growing popularity of the salmon and of the efforts on the part of fishermen and canners to satisfy the demand.

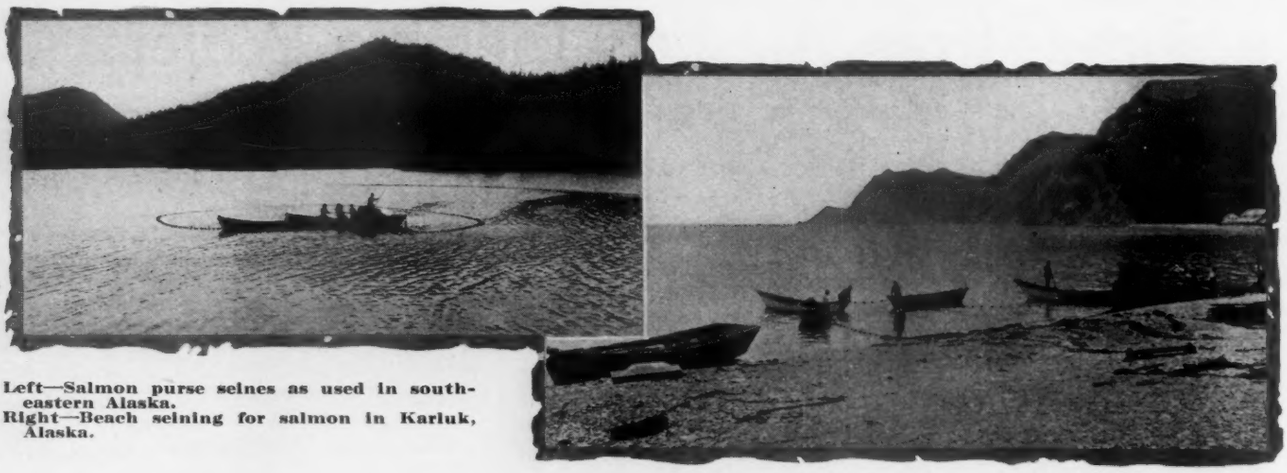
The United States Commissioner of Fisheries, Henry O'Malley, spoke thus of the Pacific salmon not long ago: "This valuable and wholesome product finds its way into every quarter of the globe, and is universally accorded a high place in the food supply of mankind. Not only is the salmon, whether eaten fresh, mild-cured, smoked, or canned, a toothsome product, but it is one that is particularly valuable in maintaining a well-balanced diet, especially because of chemical constituents and body-building materials more or less lacking in other foods." We know what an appeal salmon can make to the palate, but probably many of us will now learn for the first time that that fish can contribute so much to our physical well-being.

While the normal production of canned salmon, for example, in the Pacific Coast states and Alaska has averaged latterly approximately 6,000,000 cases annually—each case containing 48 one-pound cans, still the significant fact is that Alaska alone furnishes as a rule substantially 5,000,000 of those cases and, therefore, constitutes our main source of supply. When the waters south of Alaska became depleted of salmon, the fish-



Courtesy, U. S. Bureau of Fisheries

Left—Salmon hatchery in Alaska where efforts are being made to restock the waters. Right—Salmon cannery and reduction plant at Little Port Walter, Alaska.



Left—Salmon purse seines as used in southeastern Alaska.
Right—Beach seining for salmon in Karluk, Alaska.

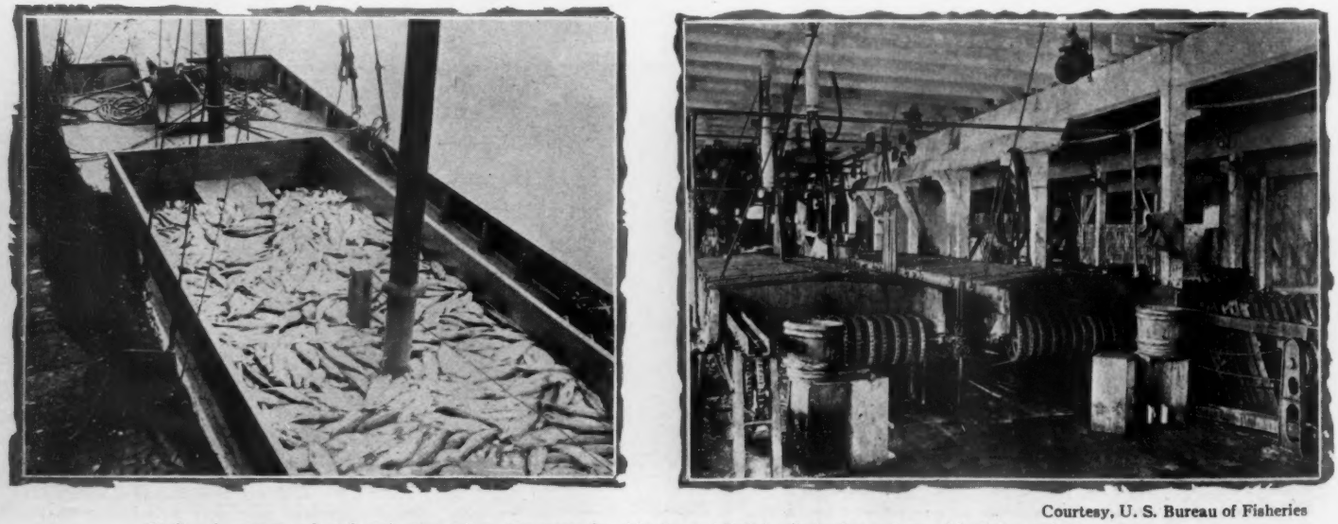
Courtesy, U. S. Bureau of Fisheries

ermen and the canners moved gradually northward and finally concentrated their activities in the waters of Alaska where numerous varieties of the fish were found to abound. It is true that millions of pounds of salmon are frozen yearly and dispatched by suitable means to all parts of the United States and Canada, but fully 90 per cent, if not more, of each annual catch is canned and thus made available for more deliberate and far-flung distribution. Salmon were first canned in Alaska in 1878, and at that time the pack was made up of only 8,159 cases. The peak year was reached in 1918, when the 138 canneries operating in Alaska packed more than 6,000,000 cases—the value of the product then being in excess of $50,000,000.

Five species of salmon are caught in the waters of Alaska, and these are known as the coho, or silver; the chum, or keta; the pink, or humpback; the king, or spring; and the red, or sockeye. For years the red salmon was the favorite—largely because of its color when cooked; but today all species are canned and are readily marketed. The king salmon is the largest of the Pacific salmons. It averages 20 pounds in weight, but some of 70 pounds or more have been taken. The red salmon ranges around 7 pounds; the coho averages 8 pounds but may attain to a weight of 30 pounds; the pink salmon, the smallest of the five species, is caught weighing from 3 to 11 pounds; and the chum has an average weight of 9 pounds and may reach a maximum of 16 pounds.

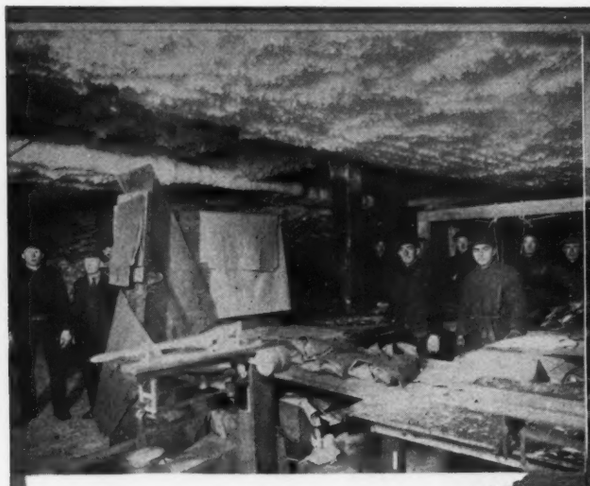
The curious characteristic common to all the Pacific salmon is that they do not spawn until they attain their maturity, and then they spawn but once and die usually within a few days afterwards. The life cycle of the different species of salmon varies: with some the period is but two years; with others it is three years; and with those that live longest the cycle covers a span of eight years. This unexplained fact adds in no small measure to the problem of assuring an ample return of mature fish to the spawning grounds, and it also has a direct bearing upon the difficulties of artificial propagation as a method of restocking depleted waters. It is well known that salmon do not immediately work their way seaward after hatching. Some of them have been found to stay in fresh water anywhere from three to four years before going out into the ocean.

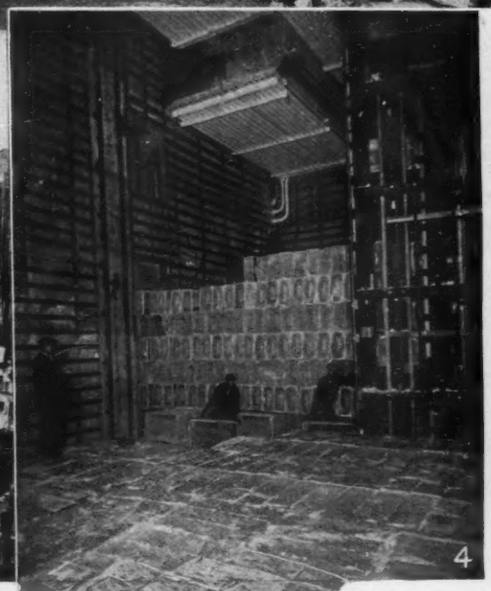
In a general way, most of us are aware that salmon will travel up rapidly running streams and even swim vertically through falling waters in a desperate attempt to reach their particular spawning grounds, where they can reproduce their kind before dying. By one of Nature's inscrutable laws, full-grown salmon are impelled or guided by an instinct akin to that characteristic of the homing pigeon; and research has definitely established that certain species will invariably return to their parent stream for spawning. So strong is this urge that the returning fish will often seek the very points in the parent stream where they were severally hatched. There is reason to believe that all Pacific salmon come back to parent streams for spawning. These journeys may vary in length from a few miles to fully 2,000 miles; and in each instance the fish seems to be endowed with reserve capacity sufficient to enable it to reach its goal even though it does not feed from the time it enters the waters of the parent stream until it spawns and dies! To reach its destination far up the Yukon, for example, the salmon must advance against swift and strong currents at a rate of 50 miles a day. Manifestly, Nature has adapted each species so that it can return to its place of birth in



Courtesy, U. S. Bureau of Fisheries

Left—A cargo of red salmon at a cannery in Alaska. Right—Interior of an Alaskan salmon cannery.





1—Here frozen salmon and halibut are being glazed with a protecting film of ice before wrapping for shipment to distant consumers.

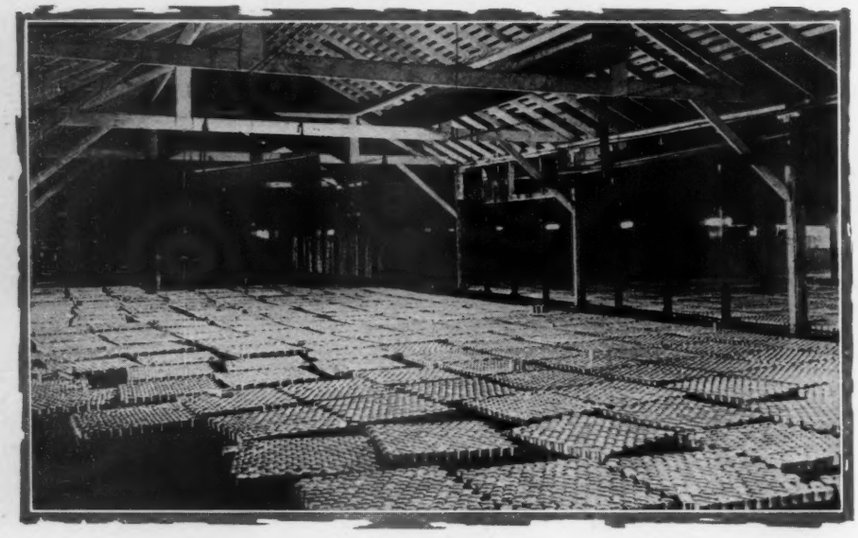
2—Freezing room, of the Ketchikan Cold Storage Company, where thousands of pounds of salmon or halibut can be frozen in from 16 to 24 hours immediately after landing from the fishing boats.

3—City float boats and part of the fleet of fishing craft at Ketchikan, Alaska.

4—This is the capacious ice-storage room of the Ketchikan Cold Storage Company in which large quantities of ice are held for various services in connection with the fisheries.

5 — Close-up of 50,000 pounds of fresh king salmon bedded in crushed ice to keep them until they can be put in the freezer.

Fisher Studio, Ketchikan



Ewing Galloway, New York

Freshly canned salmon in a large cooling room.

a given river no matter what the handicaps may be; but the same fish might be unequal at maturity to the task of returning to the waters of another stream in which it may have been placed by man after artificial incubation as practised at hatcheries. This phase of the restocking problem—fully recognized by the experts—has emphasized the impracticability of replenishing the salmon of Alaska through the agency of hatcheries that have proved effective elsewhere. As investigators of the Alaskan salmon fisheries have ascertained to their satisfaction, the only way to insure restocking is to let the fish do it themselves by enabling substantially 50 per cent of the returning mature salmon to reach their spawning grounds. This, so it is believed, will suffice to neutralize or to offset the ravages of the natural enemies of the salmon and their spawn.

Some salmon will spawn in streams that can be reached a short distance from the sea; others will spawn in rivers that take the fish much farther inland; while certain species will spawn only in lakes tributary to rivers flowing ultimately into the sea. The question is often asked: "Why should the salmon leave the waters of its birth, travel seaward where it attains its full growth, and then journey back to the parent stream to reproduce its kind once and die?" The explanation is that in the remote past the salmon may have been a fresh-water fish that subsequently found its way to the ocean, retaining, however, a homing instinct that would possess it as soon as it reached reproductive age. Evidence of the plausibility of this explanation was cited by the late Dr. Charles Henry Gilbert, one of the greatest of our authorities, when appearing about six years ago before a congressional committee. Let us quote:

"Take the rainbow trout. I do not know whether you are aware that the rainbow trout, which lives in the coastwise streams along the Pacific, runs out to the ocean. Although it is a fresh-water fish and will stay in the streams and propagate, yet, without doubt, those that can easily reach the ocean will do so. They pass out when they are small fish and live in the sea for two or three or four years, as the case may be, and come back apparently salmon—you could not tell them from salmon. Some of them will weigh twelve, fifteen, or eighteen pounds. That is the history of a fresh-water fish. Is it not possible that all salmon were originally fresh-water fish that formed the habit of going out to sea, where they can get an abundance of good food, and then coming back to their native place to spawn?"

Now for a few words about the habits of the salmon at the climacteric period of its life. When the fish have reached the spawning beds, male and female of the species pair off and select an area on the stream bottom where the eggs are to be laid and, by motions of their bodies and tails, excavate a pit in the coarse gravel to a depth of from 12 to 18 inches. The eggs are laid in layers and fertilized, and over each succeeding layer the fish spread a covering of gravel. This process continues until all the eggs are laid and the nest is filled level with the stream bottom. If the water be not too cold, the eggs will hatch in the course of something like 30 days; but the little fish will remain in the gravel, protected from enemies, perhaps for weeks, subsisting upon the nutritive substance of the eggs from which they were hatched and to which they are still attached. When this food is entirely consumed, the wee salmon, urged by the pangs of increasing hunger, wriggle their way upward through the covering gravel and rise to the surface of the stream where they hunt about for food. It is while in this immature state that they are destroyed in large quantities by rapacious trout.

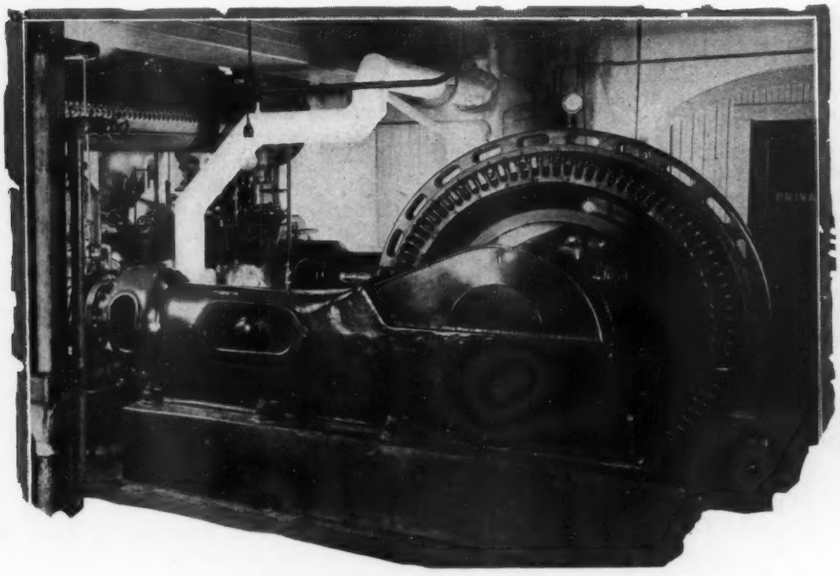
Lest we have not made it clear, let us emphasize that the fish caught for the market are taken while in their prime and during their periodic movement from the sea to the spawning grounds. They are in their prime because they have attained their maximum growth in the sea and have acquired the physical capacity to fight their way if necessary to the more or less distant waters in which they are to spawn. It is the function now of the United States Bureau of Fisheries to patrol and otherwise to see to it that fishing shall be confined to certain waters and everywhere so regulated within territorial limits that the "escapement" or movement of the salmon from the sea shall be ample to restock the parent streams at the normal rate. This work, which has been in full swing for more than five years, is already yielding suggestively valuable results; and there is warrant for the belief that the salmon industry can be maintained at a high standard of output indefinitely where not long ago it threatened to bring about its own destruction through too intensive fishing.

Much of the positive information obtained regarding the Pacific salmon is the result of extensive and prolonged research. Thousands and thousands of salmon have been marked with tiny non-hampering aluminum tags that have helped in tracing their journeyings at different stages; and markings on the salmon's scales reveal, under a powerful glass, the age of the fish just as the seasonal growth rings of a tree will tell the story of the life of that tree. But despite the wealth of data so patiently and painstakingly secured, there is still much to be learned about the salmon and what happens to it between the time it disappears into the sea and its return to the parent stream for spawning.

So far we have dealt with only the salmon, but let us touch briefly upon the halibut, the largest of the flounder group. This fish has been caught weighing more than 400 pounds, but its average weight when taken ranges

Ewing Galloway, New York

Close-up of a catch of salmon just after delivery at a cannery.



Fisher Studio, Ketchikan

An Ingersoll-Rand ammonia compressor in the Ketchikan Cold Storage Company's plant.

between 15 and 20 pounds. The halibut, while an active swimmer, lives mostly on the sea bed at depths varying from 150 to 300 fathoms. The older fish abound in the deeper waters, where they gather into dense schools in the fall to lay their eggs. We are indebted to W. F. Thompson, of the International Fisheries Commission, for the following interesting particulars:

"Whether the young fish that are carried far out to sea descend, as they develop, into depths in which they cannot exist is unknown. They are next recognized as young fish in the bays and bights of the Alaskan coast. As they grow they stay more or less at home, shifting to schools of their own size. The fishermen begin to take them at the age of five years, when the smallest weigh two or three pounds. The halibut continue to grow at a variable rate according to the bank on which they are found. Their ages are determined by the annual changes in growth recorded in the bones, particularly in the otolith or ear-stone in the head which has rings much ike those of a tree. From these lines we learn that the young fish trebles its weight in three years to become a 6-pound fish. Then it doubles its weight in the next three years to become a 12-pound fish. It continues to increase in length at a continually slower rate until at the end of 35 years it reaches 150 to 200 pounds. It first spawns about its twelfth year, and undertakes migrations for the purpose of spawning—unlike the stay-at-home immature fish. Each halibut lays as many as a million and a half eggs during a spawning season."

Although each spawning halibut lays so large a number of eggs, still the eggs and the young fish hatched from them have many enemies, and therefore relatively few of them survive to reach maturity or sizes of commercial value. Accordingly, government experts, on behalf of both Canada and the United States, are engaged in research and regulatory work calculated to help the halibut to reproduce their kind in sufficient quantities to keep our tables supplied with this delicious seafood.

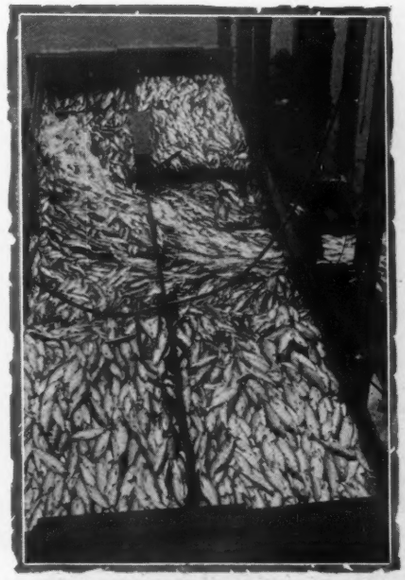
Much has been written descriptive of the means and methods employed in canning Alaskan salmon under governmental supervision so as to insure hygienic conditions and thoroughly wholesome products, and we shall, for that reason, not dwell upon this phase of our subject, important as it is. We shall conclude our story with an outline of how salmon and halibut are frozen and prepared so that they can be shipped thousands of miles from their source for our delectation. It will probably surprise most of our readers to learn that 90 per cent of the fresh halibut eaten by us is caught in the waters of Alaska; and a very large share of our fresh salmon originates there, too.

The up-to-date plant of the Ketchikan Cold Storage Company, Ketchikan, Alaska, affords an excellent example of the practices followed in freezing salmon and halibut for distant consumption. The fish are washed, split, and cleaned—the heads and the tails being removed the while. The fish are then placed in sharp freezers where the temperature is maintained at from 6 to 7 degrees above zero Fahrenheit. Salmon are kept in the freezer from 16 to 18 hours, while the larger halibut remain there 24 hours in order to complete the freezing process. The low temperature insures rapid freezing and the formation of small crystals in the tissues instead of large ones, as would be the case if the freezing were done at a higher temperature and over a longer period. Because the small crystals do not rend the tissue as large crystals would do, the succulent juices are retained when the fish is cooked instead of escaping and leaving the flesh flat and unpalatable. After the fish are frozen they are dipped in fresh water which, in its turn, freezes and forms a thin layer of ice that seals the halibut or the salmon from the air. The fish are then held in storage at a low temperature until it is time to ship them, when they may be wrapped in paper and packed in boxes to be transported in refrigerated boats from Ketchikan to Prince Rupert, B. C., and carried thence to Chicago and other eastern points in refrigerator cars.

The refrigerating plant of the Ketchikan Cold Storage Company runs continuously for a period of six months; and during a season it will freeze approximately 6,000,000 pounds of fish. The plant's freezer is able to handle at one time 69,000 pounds of salmon; and in the course of 24 hours anywhere from 80,000 to 90,000 pounds of halibut can be frozen. The ammonia compressors not only refrigerate the freezing and storage rooms but they make ice used aboard the fishing boats to keep the catch fresh until delivered at Ketchikan as well as to preserve the incoming fish at the plant before they can be cleaned and made ready for freezing.

Whether we eat canned or frozen salmon or tickle our palates with a halibut steak, the fact remains that thousands of people are directly or indirectly engaged in gratifying our appetites while millions of dollars have been invested to render it possible to harvest the catches and to make these fishes available to us. The prosperity of the industry and the continuance of this wonderful source of delicious seafood will endure only if the general public uphold those governmental departments that are now engaged in doing everything practicable to conserve Nature's bounty in Alaska's waters.

An ingenious instrument for the detection of gear noises consists of a portable cylinder and piston to which are connected ear pieces. To trace the sound made by the machine it is only necessary to move the piston until the air column in the cylinder is in resonance with the sound.



A load of 20,000 salmon being sluiced from a barge to a conveyor running into a cannery.

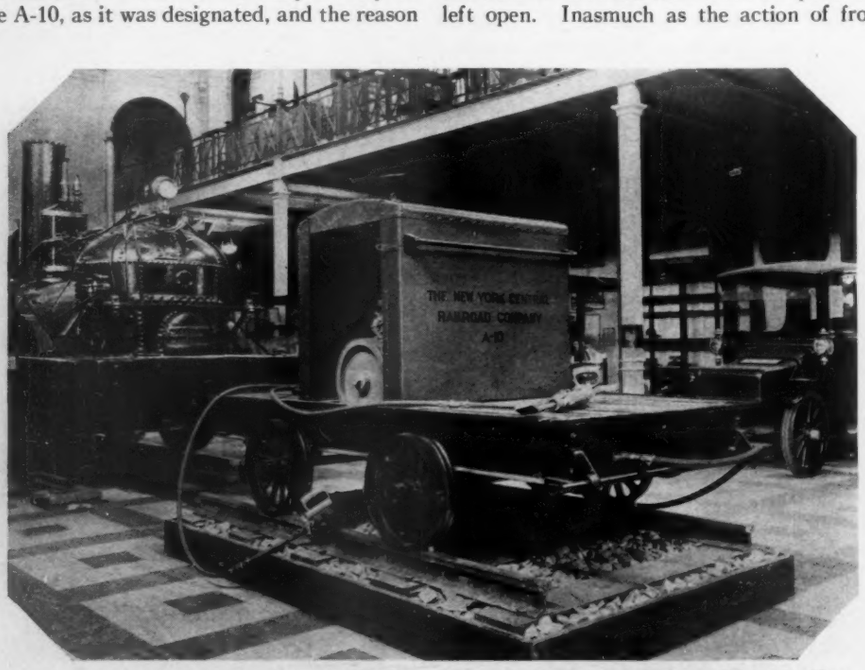
SMITHSONIAN INSTITUTION ACCEPTS HISTORIC PNEUMATIC TIE-TAMPING OUTFIT

THE fate of most old tools, machinery, and the like, that have outlived their usefulness or been outclassed by newer and more improved equipment is, generally, the scrap heap. But not so with the first commercially practicable pneumatic tie-tamping outfit used on any railroad in the United States. The outfit, after many years of valuable service, has been rehabilitated and recently donated by the New York Central Lines to the Smithsonian Institution where, along with other epoch-making inventions of a wide variety of sorts, it now forms part of that famous institution's permanent exhibit.

Back in 1913, the tie-tamping outfit in question was instrumental in effecting certain revolutionary changes in the maintenance-of-way work on the New York Central Lines. That road, along with others in this country, was then tamping ballast under the crossties by hand—back-breaking labor that was hard on the men. So when the Ingersoll-Rand Company introduced a pneumatic tie-tamping outfit—a self-contained unit that was designed to help the men with this work and to enable them to do it far better than they could by hand—the New York Central promptly decided to give the new equipment a test.

The first machine of this sort was thus put in service on a section of the New York Central's River Division near West Englewood, N. J., and was in charge of Track Supervisor John Johnson and Section Foreman C. J. Hipps. Just what it accomplished at that time need not be told here; but it is of present interest to know that its use marked the beginning of mechanical tie-tamping by our railroads. This is the early history of the A-10, as it was designated, and the reason why it did not share the fate of others of its kind.

Since the days of the A-10, pneumatic tie-tamping outfits have undergone great improvement, and are now utilized to do a multiplicity of track work once performed by hand labor. The largest of them are capable of supplying air for as many as sixteen tie tampers—as against the two with which the first machine was equipped; and, when not required for that service, they may be used variously in driving and pulling spikes; in bonding, bolting, drilling, and sawing rails; in boring ties for screw spikes; and in driving screw spikes or cut spikes.



The pneumatic tie-tamping outfit donated by the New York Central Lines to the Smithsonian Institution where it has been placed on permanent exhibition. This equipment was the first of its kind to be used in the United States.

PROTECTING STONE AGAINST HARMFUL MOISTURE

STONE, like wood, can be protected with preservatives against disintegration; but, in the case of stone, the value of the treatment has been questioned because it has been proved that the surface pores of the masonry are not always completely sealed. In the United States, the preservative most frequently used for this purpose consists of a wax of stearate dissolved in a volatile fluid, which is applied either with air spray or brush. This solution penetrates the pores of the stone; and as the solvent evaporates the wax is left in them and forms a more or less effective seal against moisture and, incidentally, against the harmful action of frost.

The theory has been advanced that frost action will destroy masonry far more rapidly when the surface pores are sealed or partly sealed but permit water to enter either from the front or the back than when the pores are left open. Inasmuch as the action of frost on stone is the result of the expansion of the water in passing from the liquid to the solid state, the theory would seem to be correct concerning masonry overmuch exposed to dampness and, therefore, highly saturated. There is warrant for the assumption that, under such conditions, the treatment would hinder or prevent the extrusion of ice through the surface pores and thus lead to far greater internal stresses than in ordinary circumstances.

To throw light on the matter, the United States Bureau of Standards has recently conducted experiments with parallel series of stone specimens. One of these was treated with a 10 per cent solution of paraffin in benzol and the other was left in the original state. Two varieties of sandstone and two of limestone, all known to have rather low resistance to frost action, were selected for the tests. After half the specimens of each kind were treated with the preservative, both series were soaked in water for fourteen days. During this interval absorption tests were made after periods of 30 minutes, 24 hours, and 14 days.

It was determined that the preservative was effective inasmuch as the stones' rate of absorption was thus greatly reduced. Yet, at the end of the fourteen days the treated specimens had absorbed from 68 to 95 per cent as much water as the untreated specimens. The two series were then put in trays containing ½ inch of water and placed in a freezing chamber where they remained until frozen. Then they were removed and thawed in water at room temperature. This cycle was repeated until the specimens were disintegrated.

In summing up the results, the Bureau says: "All the treated specimens showed higher resistance to frost than the untreated ones. The increased resistances computed as a percentage of the number of freezings required to disintegrate the treated material were as follows: One sandstone was improved 350 per cent, another 260 per cent, one limestone 190 per cent, and the other 53 per cent.

"These experiments indicate that such a preservative treatment is of value on the types of stone under consideration even under very severe conditions of saturation. It also seems probable that where such stones are placed in the walls of a building and exposed only to the intermittent soaking of rains or thawing snow that the treatment would be far more effective than indicated by these tests."

The world's highest suspension bridge is now in course of construction across the Royal Gorge near Canyon City, Colo. From the floor of the structure to the bed of the Colorado River is a drop of 1,050 feet—more than double the height, it is said, of any other bridge of its kind. The span will have a length of 1,200 feet and will be supported by two 9-inch-diameter cables, each of which is made up of 2,100 steel wires. While designed to carry a load of 540 tons, the bridge has been built to withstand four times that weight, that is, with a great measure of safety.

Sugar Making in the Philippines

By C. H. HIRST

THE manufacture of cane sugar in the Philippine Islands takes us back to the sixteenth century, for as early as 1521 historians related that cane was cultivated there and juices extracted from it for various purposes. However, no great amount was exported to the United States until 1795 when, according to Government reports, less than 150 tons was shipped from the Philippines to our markets.

Production did not increase perceptibly, however, until after the Spanish-American War, when American methods and capital combined to develop additional cane land. Today, the annual output of centrifugal sugar is approximately 650,000 long tons. But when it is considered that the sugar exported to the United States represents only 8 per cent of our total consumption, that amount does not seem very large.

Plowing a cane field in the Philippines. The carabao or water buffalo is the farmer's principal beast of burden.

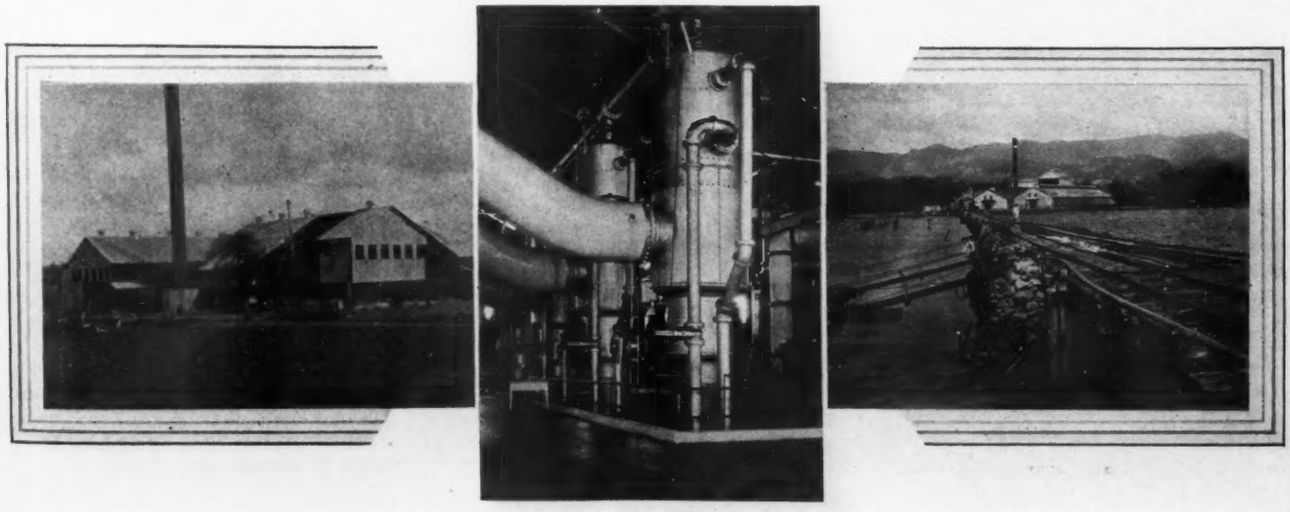
By centrifugal sugar is meant brown sugar which has yet to be treated in the refinery where color and other so-called impurities are removed in order to make white or table sugar. There are still in existence in the Philippines, many old-fashioned *muscovado* mills where the juice is extracted from the cane by crude methods and then boiled down in open pots over fires which cause much burned sugar. Luckily, only about 15 per cent of the total sugar produced is made in these relics of the nineteenth century; and every year more planters are sending their cane to modern "centrals", where they get in return 60 per cent of the sugar manufactured from their cane. As this is about twice as much as that obtained in their own *muscovado* mills, there is no denying the efficiency of present-day machinery and methods.

The modern sugar central consists mainly of two departments: the mill, where the juice is extracted, and the boiling house where the juice is concentrated and the water removed, leaving the sugar. Cane is brought in from the fields by various means of transportation —by carabao carts, automobile trucks, river boats or *lorchas*, and by rail. Some of it is even sluiced down in flumes.

At the central, the cane is either dumped or raked off into carriers which take it through the first or initial operation of leveling or cutting by means of revolving knives. After it has been thus prepared for the mill, two coarse-grooved crusher rolls break up and crush the outer tough fiber of the cane, extracting some juice as well. From there the cane goes through the mill proper, consisting of from nine to fifteen or more rolls, usually about 34 inches in diameter and 72 inches long. These are disposed in sets of three, one upper and two lower rolls. A pressure of about 600 tons is applied to the upper rolls by means of hydraulic jacks maintaining a pressure of 3,000 pounds per square inch on two 14- or 18-inch-diameter plungers. After the cane has passed through the first set of rolls, maceration water is added to it, and this helps to extract additional juice. Extractions of 93 per cent and better are usually obtained. The juice is caught in troughs, under the mills, and is screened to remove as much *bagasilla* as possible before going to the boiling house. The fiber which remains after the treatment of the cane in the last mill is fairly dry—containing only 40 per cent moisture, and is conveyed to the boilers where it is burned as fuel. Most centrals are independent of fuel charges, as the quantity of bagasse available is sufficient to make the steam necessary to drive the prime movers as well as for the boiling processes.

The raw juice is quite acid; and before it undergoes any concentration it is neutralized by the addition of milk of lime. The juice is first heated, then the lime is added. In addition to its neutralizing effect, the lime causes impurities or fine particles of cane to be precipitated. This precipitate, called "mud", is forced through filter presses; and the expressed juice, together with the clear juice, is pumped to evaporators. The solids remaining on the filter-press plates are removed and sometimes used as fertilizer in the cane fields. By another process the precipitate from the settling tanks is carried back to the mill and mixed with the cane—the solids finally accompanying the bagasse to the boiler furnace.

The clear juice now enters what is probably the most efficient piece of apparatus in the sugar mill, the multiple-effect evaporator. This consists of two or more cells in which



Left—Large central nearing completion. Center—A battery of Ingersoll-Rand barometric condensers. Right—Picturesquely located sugar mill.

the juice is boiled continuously under vacuum. Exhaust steam from the prime movers and under about 10 pounds gage pressure enters the steam belt of the first evaporator, boiling the clear juice, the vapor from which is led to the steam belt of the next evaporator under about 0 pound gage pressure. Due to its contained heat, the vapor boils the juice in the second evaporator—the resulting vapor being used in the third, and so on. A vacuum of from 26½ to 28 inches must be maintained in the last evaporator for its efficient functioning. This is accomplished by means of a barometric condenser which condenses the vapor from this last cell, the non-condensible gases being removed by a dry vacuum pump. This multiple-effect evaporator, then, by the use of low-pressure steam in but one cell, is able to boil the juice in several cells, concentrating it to about 60 per cent sugar. The product of this treatment is called syrup.

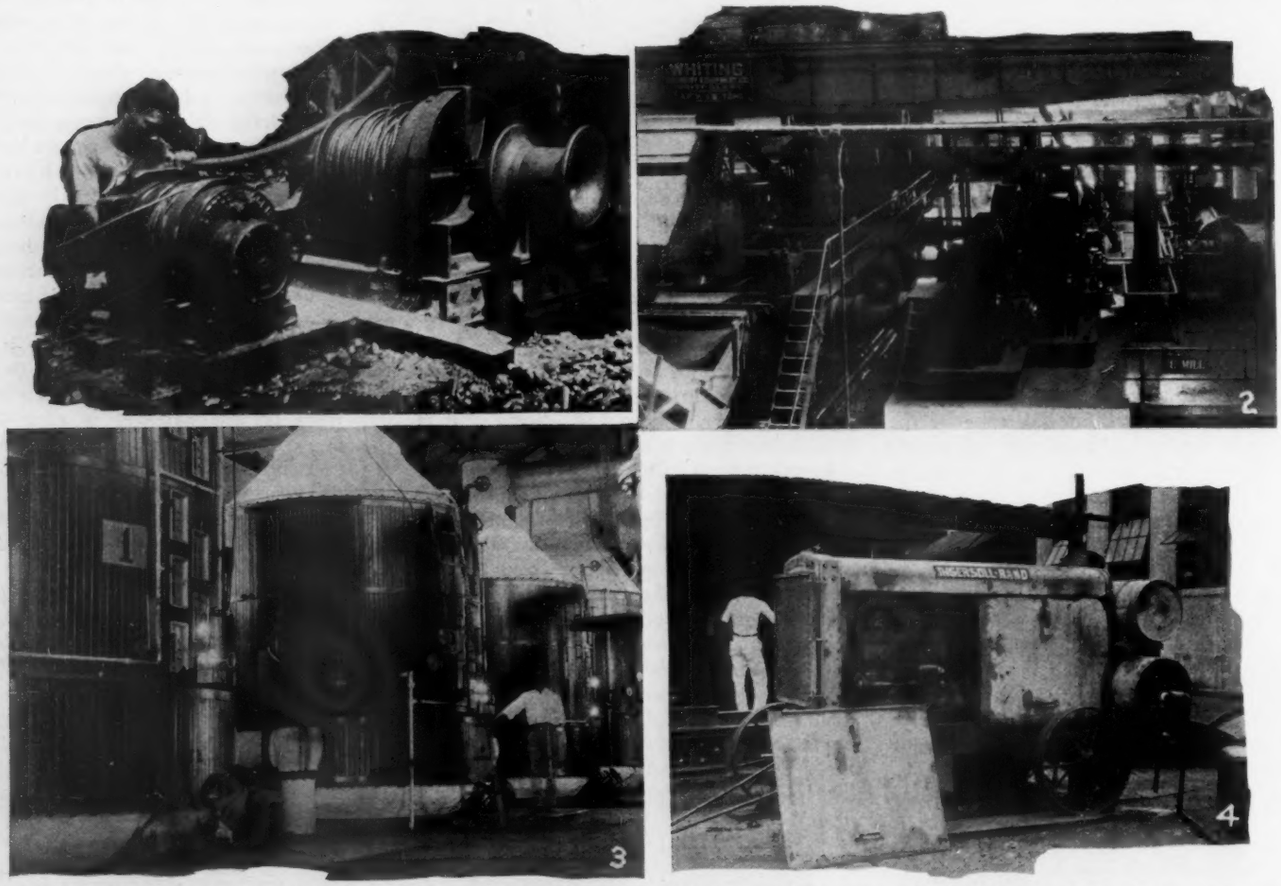
From this point on, further concentration must be accomplished with more care. The syrup now enters a vacuum pan, which is similar to the first cell of the evaporator. Boiling is done by means of 10 pounds steam, as before—a high vacuum being maintained inside the pan. If this vacuum were not maintained continuously, the rate of boiling would be diminished and the efficiency of the mill lowered to a point where it would become necessary to burn more fuel, which would have to be purchased.

Boiling goes on for three or four hours until the sugar starts to grain. When this has continued to the proper point, as determined by the operator, he calls out, "strike". Immediately the vaccum is broken, and the mixture dropped from the bottom of the pan into crystallizers. The syrup has now become a heavy mass, almost black, and is called *massecuite*, containing about 85 per cent sugar. The duty of the crystallizer is to mix the new *massecuite* with seed sugar left over from the previous strike, and to complete the graining. Slowly revolving arms thoroughly stir the mixture.

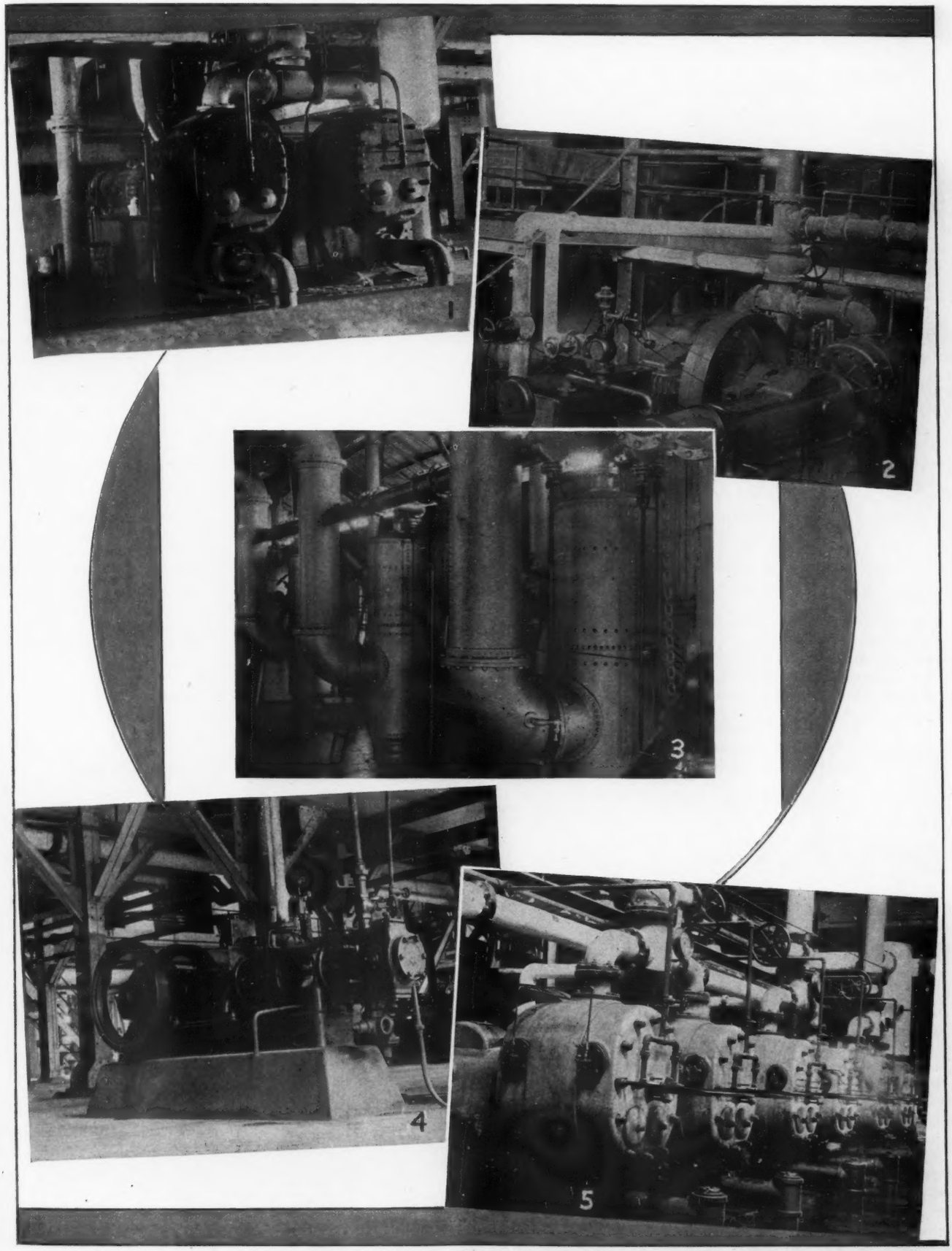
The contained liquid is in the form of a heavy molasses which must be separated from the mass, and this is accomplished by centrifuging. The *massecuite* is dropped from the mixing troughs directly into centrifugals, which revolve at about 1,200 revolutions per minute. The molasses is thrown through the fine screen of the baskets while the dried sugar is removed through the bottom. The product is practically the same as our household brown sugar. It is bagged in 125- or 140-pound sacks and stored awaiting shipment to refineries in the United States, where further processing and treatment result in the familiar white or table sugar. At this stage, the molasses contains some unrecoverable sugar; but its real commercial value lies in the fact that it can be fermented and made into grain alcohol—many centrals having their own distilleries for this purpose. Further processing results in the production of ether; and this is sometimes used as a volatilizing agent which, when mixed with the alcohol, gives a motor fuel. The pure alcohol is marketed for manufacture into liquors, and part of it is exported to China.

The sugar-grinding period in the Philippine Islands is generally of less than five months duration annually. Because of this seasonal character of the work, which is, of course, a handicap, it is of the utmost importance that the mills be equipped with the most up-to-date and reliable machinery. A major breakdown, necessitating a shutdown when operations are at their height, is a serious matter, as the cane must be harvested and milled when the plant's sucrose content is at a maximum.

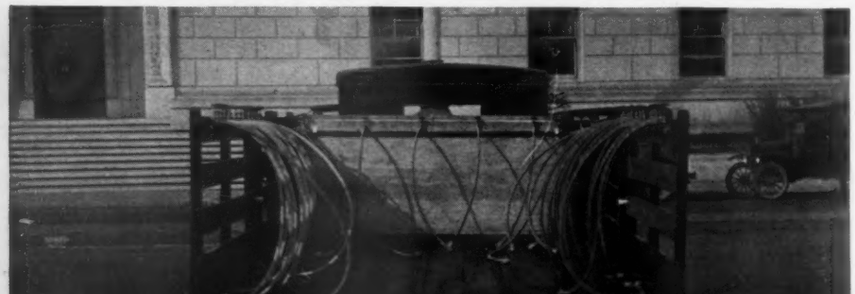
Crude plowing methods still exist, and these are a further handicap. However, tractors and deep plowing are being used more extensively every year; and it is likely that within a decade the sugar industry of the Philippines will have discarded all obsolete practices and will have reached a much higher overall efficiency.



1—This "Little Tugger" hoist does the work previously done by a 10-hp. gasoline hoist. 2—A typical mill for the crushing of sugar cane in an up-to-date Philippine central. 3—These vacuum pans are served by Ingersoll-Rand barometric condensers. 4—Portable compressors are used around sugar mills to furnish air to operate various pneumatic tools employed in making repairs and alterations.



1—Two Imperial dry vacuum pumps. 2—One of two Imperial Type X vacuum pumps in a Negros Island sugar plant. 3—Barometric condensers in a central on Negros Island. 4—An FR-1 steam-driven compressor in the plant of a Philippine milling company. 5—A group of three large Imperial dry vacuum pumps in a Philippine central.



Truck designed for the transport of live fish. By way of the manifolds, with their flexible hose connections, the water in the numerous tanks carried is kept properly aerated. Compressed air for this purpose is drawn from a receiver beneath the truck.

SPECIAL TRUCK SUPPLIES AIR TO FISH IN TRANSIT

THE transportation of live fish from hatcheries to aquaria and waterways that are to be stocked offers less difficulty now because of a special truck that provides for the needs of the finny creatures during transit. Such trucks are used by the California Fish and Game Commission; and they deliver their live loads, obtained at the Mount Whitney Hatchery, to points far and wide with few casualties. This is because they are equipped to aerate the water in the numerous tanks carried so that the fish may at all times be assured an ample supply of oxygen, without which they cannot survive.

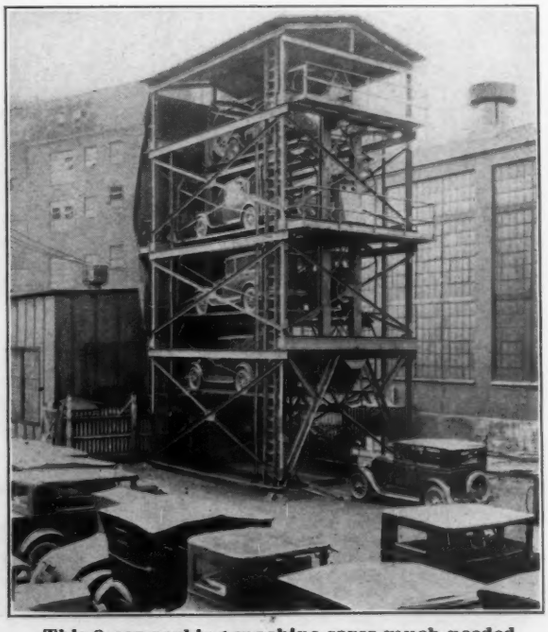
Compressed air is used for this purpose. This is provided by a small compressor, run by the truck engine, and is stored in a large receiver secured under and at one side of the vehicle. From the receiver the air is piped to two manifolds—one on each side of the truck, and is thence distributed to the separate tanks by way of multiple flexible hose lengths. The fish are thus supplied with sufficient oxygen without interrupting the journey frequently, as had to be done previously to aerate the water by dipping it out of the tanks and then letting it fall back again.

RADIO PICTURES RECEIVED BY AIRPLANES IN FLIGHT

THE practicability of sending pictures by radio to airplanes in flight was successfully demonstrated not long ago in Germany; and, as a result, the Deutsche Luft Hansa is seriously contemplating making use of this graphic means of communication in connection with its long-distance airways. For the tests, one of the company's flying machines was equipped with a Telefunken receiving set designed especially for airplane service.

The Berlin radio station transmitted the pictures, and first sent a weather map to the plane while on its way to Cologne. This enabled the pilot to determine far better than he could have done even with a detailed report what sort of meteorological conditions he would encounter *en route*. On another trip he got a similar chart that gave him full information of an advancing thunderstorm. Knowing the speed at which he was traveling, he was thus able to tell at what point along his course he would be apt to encounter the storm and to steer clear of the indicated area of disturbance. Again, when flying to a certain airport that had in the meantime been flooded by heavy rains, the aviator was advised of that fact by a radio picture of the field in that condition. So forewarned he lost no time in avoiding it and seeking a suitable landing place elsewhere.

The element of time is a vital factor in aerial navigation because minutes mean miles covered. For that reason any saving in time in putting a message across accurately is worth while; and pictures, frequently, are not only more explanatory than words but can be taken in at a glance. The actual transmission is also but a matter of minutes: by the system under consideration an airplane can receive a chart or picture within three minutes after its dispatch.



This 8-car parking machine saves much needed ground space at the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company.

NOVEL GARAGE HELPS TO SOLVE CAR-PARKING PROBLEM

WITH parking space for automobiles in most large cities of the United States at a premium, the garage developed by engineers of the Westinghouse Electric & Manufacturing Company would seem to be at least a partway solution of what has come to be a very vexatious problem. Occupying as it does relatively little ground space—not more, in fact, than the average double garage for family use—the structure can house numerous cars, its capacity depending upon its height. This parking garage can be set up in units of one or more on a vacant lot or any other convenient place where sufficient space is available, or it can be made an integral part of apartment houses, stores, hotels, theaters, office and public buildings, and kindred large structures, to that extent keeping the streets in front of them clear for the moving traffic.

The parking machine, as the Westinghouse Electric & Manufacturing Company calls it, is nothing more than a framework of steel in which two endless chains pass over wheels at the top and the bottom. Suspended between these chains are platforms, each of which accommodates one automobile. When wishing to park his car, the motorist drives it on to the lowermost platform, where it remains until he comes to claim it. Having left it there he goes over to a lever, pulls it, and obtains a check—his car in the meanwhile being automatically carried upward by the chains which place another empty platform at ground level ready for the next vehicle. To get his car, the motorist needs only to push a button corresponding to his check, and immediately the mechanism begins to operate and continues to do so until his particular automobile is delivered to him at street level. Nothing could be simpler, as the delays incident to parking in a crowded garage are avoided.

At a Danish shipyard there has recently been launched a vessel that has been designed especially for the transportation of bulk cement. Like an oil tanker, the craft is divided up into compartments or tanks—in this case, seven in number, having a combined capacity of 1,400 tons of cement. Loading and unloading is effected by means of pneumatic conveyors now so commonly employed in handling grain and other bulk commodities.

Palisades Interstate Park Is Adding Another Link to Its Fine Highway System

By A. M. HOFFMANN

PALISADES Interstate Park—that far-flung public playground that stretches for a distance of quite 24 miles along the west shore of the scenically beautiful Hudson River—has become the mecca for more than 7,000,000 persons annually. This is not to be wondered at, for within its confines lies a region of 48,000-odd acres of unspoiled forest land that beckons invitingly especially to the dwellers of the nearby congested City of Greater New York. There, all the year round, in the hills and the mountains, along lakes and streams, the nature lover can find the recreation that he seeks, whether it be motoring, hiking, camping, swimming, boating, skating, skiing, or some other wholesome out-door sport. He can enjoy them all, and in a setting of exceptional charm.

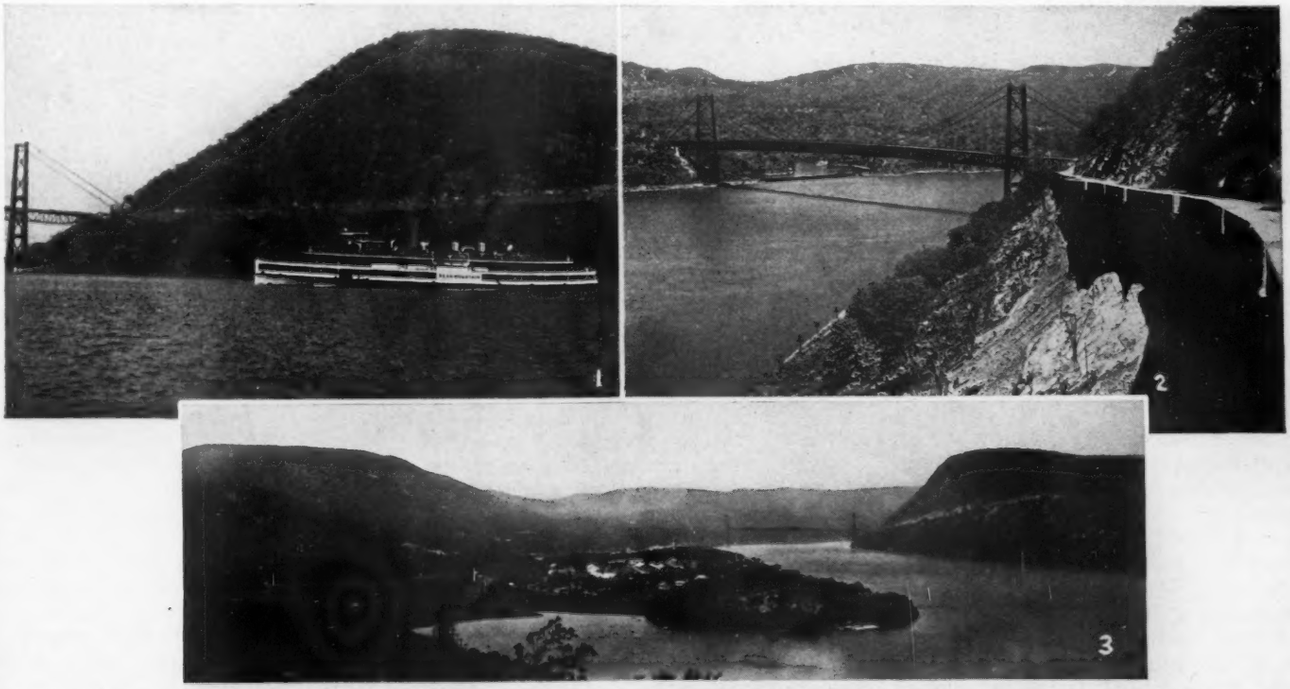
The conservation for all time of this great park system is an unusual story of interstate coöperation that had its inception back in the early "nineties" when extensive quarrying along the Palisades, in New Jersey, threatened the defacement of that striking geologic feature of the Lower Hudson. The exploitation of those towering cliffs for trap rock and paving blocks, and, later, for stone for concrete aggregate, brought vigorous protests from the people on the New York side of the river who foresaw the complete destruction of these picturesque rocky walls unless something were done to put a stop to it.

Not until 1900, however, after commissions had been appointed by the two states concerned to report on the condition of the Palisades and to suggest measures for their protection, was anything accomplished. Early in that year the New York Legislature passed an act constituting a permanent Interstate Park Commission with power to acquire whatever territory was deemed necessary to save the Palisades which, so we are told, the Indians called "We-awken", meaning "rocks that look like trees". This act was signed by the then Gov. Theodore Roosevelt on March 22. A similar bill before the New Jersey Legislature was bitterly opposed by the quarrymen operating along the west bank of the Hudson; but advocates of the measure rallied to the cause and secured the passage of the bill.

The joint commission began work during the spring of 1900 with only $15,000 in cash —$10,000 granted by the New York Legislature and $5,000 by the New Jersey Legislature. With this modest capital they set out to survey that section of the Palisades extending for twelve miles along the shore from Edgewater to the New York State line—expending $5,000 for the purpose. With the remaining $10,000 they secured an option on the Carpenter Brothers' Quarry, north of Fort Lee, where 12,000 cubic yards of rock was being blasted down daily. It was the large-scale operation at this plant that had really aroused public opinion in the first place and started the movement that resulted in the conservation of the Palisades. The actual purchase of the property was concluded early in 1901 through the generosity of the late J. Pierpont Morgan, who gave the $122,500 required to close the deal.

It is worth recalling now that the option which put a stop to the blasting at the Carpenter Brothers' Quarry became effective on December 25, 1900—so that Palisades Interstate Park may rightly be looked upon as a Christmas gift of an enduring nature from the states in question to the people. Subsequently, New Jersey appropriated $50,000 and New York $400,000, and these sums, together with large donations from private individuals, made it possible to buy the additional 146 parcels of land in what is today known as the Palisades Section of the park. This section covers 1,000 acres and represents less than 3 per cent of the present reservation. The interesting part of it all is that New Yorkers were willing to expend thousands of dollars for the purchase and the development of land in New Jersey so that the beauty of their view might not be marred.

What has been done during the years that have intervened to prevent further inroads by



1—One of the numerous excursion steamers on the Hudson that carry thousands of visitors to Palisades Interstate Park during the summer months. 2—Bear Mountain Bridge which has made the park, to the left, more accessible to New Yorkers. 3—View of the Hudson looking northward from the new Bear Mountain-Tomkins Cove Highway.

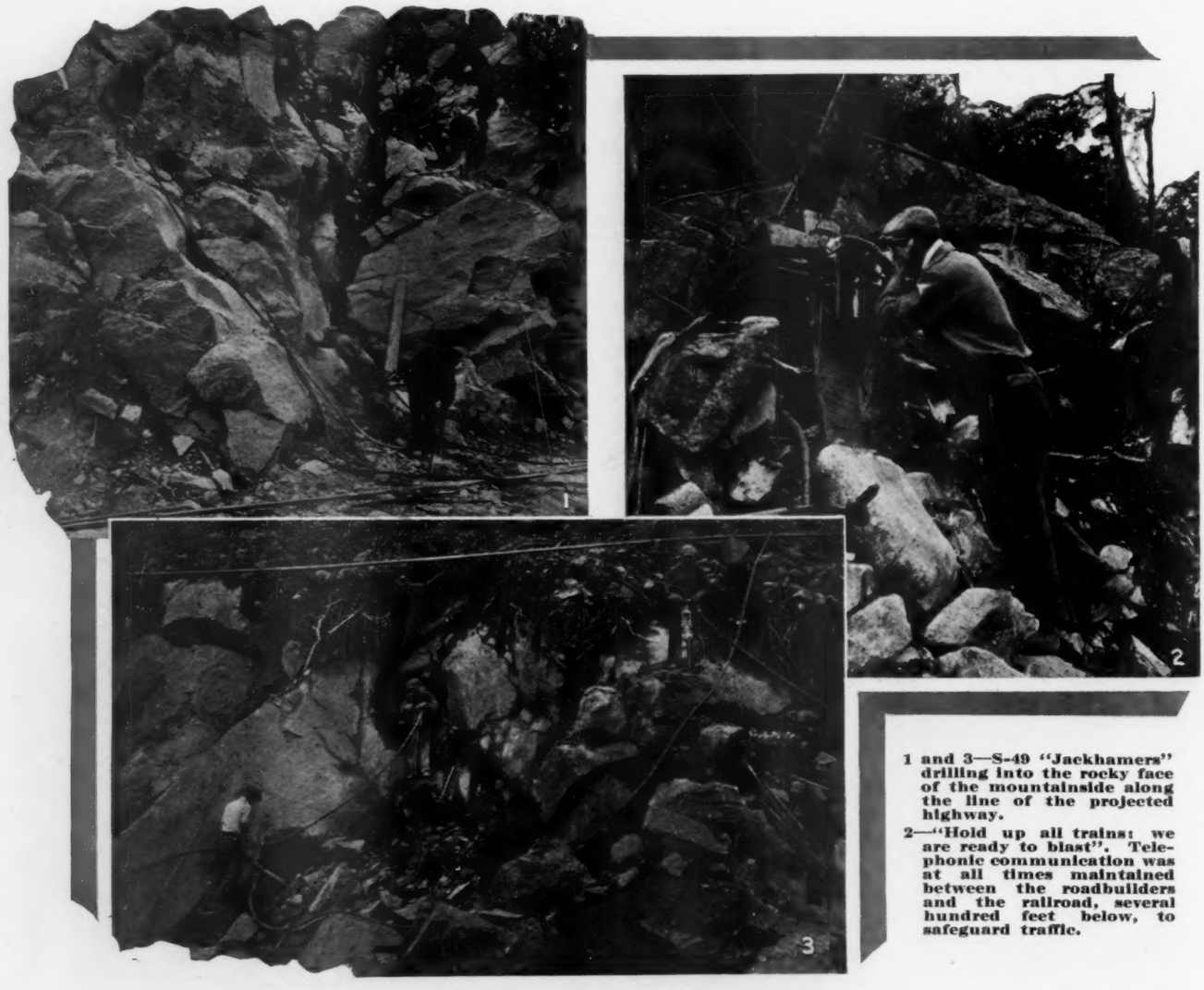
commercial interests upon the Palisades north of the New Jersey State line and to extend the boundaries of this public playground is a page in the history of conservation for the benefit of the populace that is decidedly unique, and of which the peoples of the states concerned might well be proud. Not only does it reflect great credit upon the commission but also upon those philanthropic men and women who gave unstintingly so as to create what is perhaps the finest natural park for recreational purposes in the East.

To recount all that has happened since the interstate commission began its epoch-making work would take up too much space and, perhaps, weary the reader, but it should be mentioned that from November 1, 1901, to May 31, 1928, its report shows gifts of land and money to the value of $8,076,289.16 from private individuals. The largest single donation was that of a tract of 10,000 acres and a trust fund of $1,000,000 from Mrs. Mary W. Harriman as a memorial to her husband, the late E. H. Harriman. During that time New Jersey appropriated $2,277,993.86 and New York $12,111,088.60, including the value of state-owned land transferred to the park system—making a total investment in the Palisades Interstate Park of substantially $22,500,000.

In order to make clear just what Palisades Interstate Park means to the people something should be said about the recreational facilities that have been provided there for their pleasure. Splendid camps, some of which are suitable for winter occupancy, are available for the most part in Harriman State Park, where there are numerous beautifully situated lakes that lend themselves especially well to this form of out-door life. In 1928 more than 53,000 were accommodated in these camps, which can take care of 8,424 persons at one time. Latterly trail shelters have been built for the convenience of overnight-camping parties, a sport that has become increasingly popular of late years.

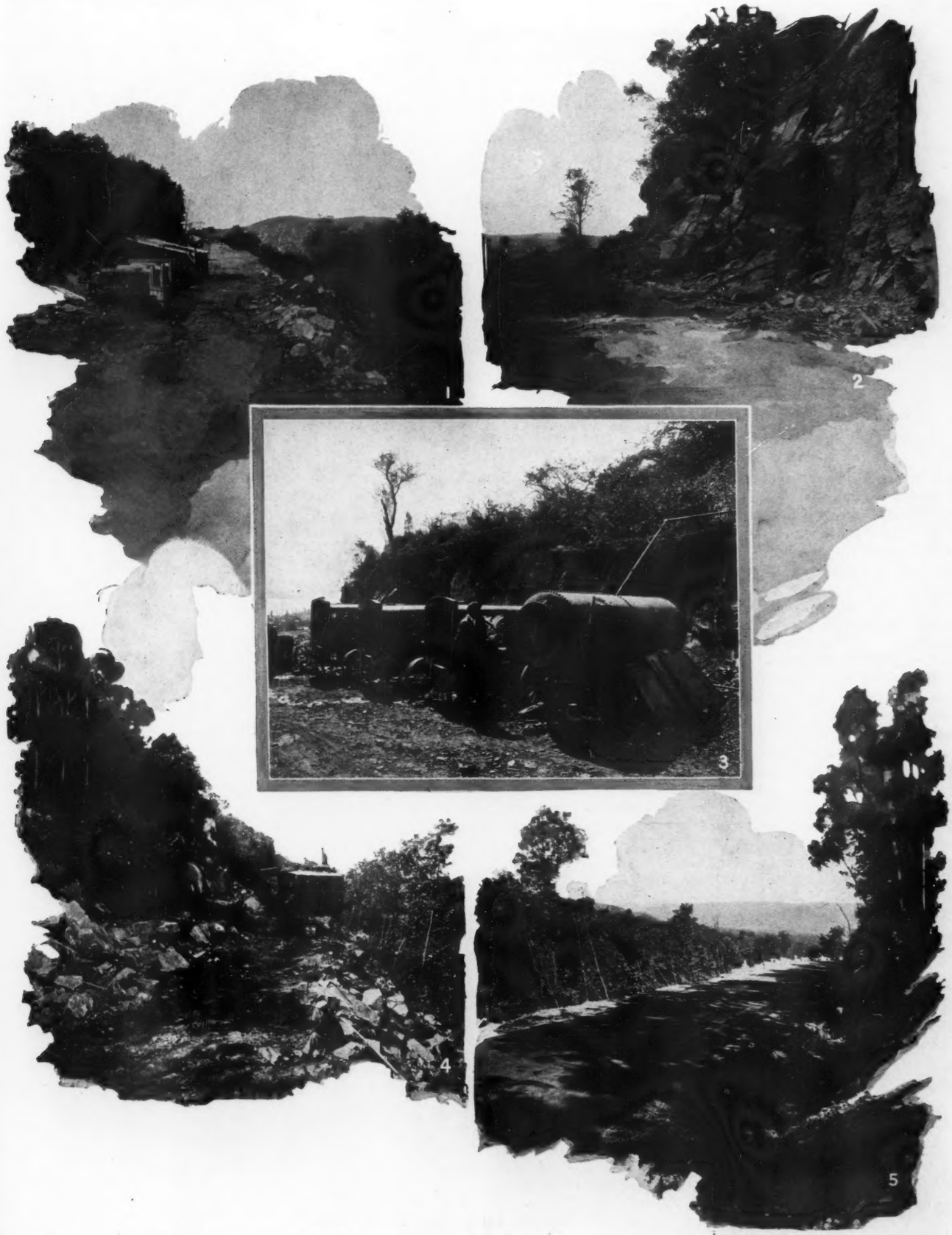
In Harriman State Park alone there are now in excess of 300 miles of well-marked trails through woods and over mountain tops—and it is worth noting that much of this work of trail-blazing has been done by enthusiastic members of New York and New Jersey walking clubs in coöperation with the commission. Upwards of 800 rowboats are maintained for the use of the campers and the general public; there are expansive playgrounds for those who wish to indulge in games of all sorts; and an enclosed rink has been provided that is suitable for roller skating in summer and ice skating and hockey during the winter months. The ski jump near Bear Mountain Inn is said to be the finest in the East—the competitions now held there annually attracting hundreds of people. In fact, ever since winter sports were introduced in Palisades Interstate Park ten years ago it has not been closed for a single season.

As was to be expected, roadbuilding has kept pace with the development of the region. Back in the "nineties", when active steps against the destruction of the Palisades was first begun, one writer referred to them as the "Unknown Palisades". That was true enough, for up to 1895 their summits were covered with an unbroken forest. By land, the waterfront could be reached only from a few points, and then by paths that wound dizzily down the steep cliffs. Today, a fine

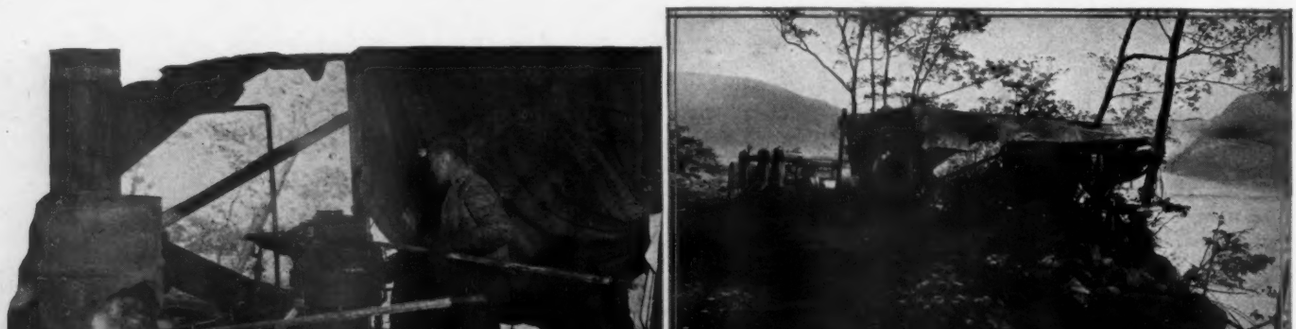


1 and 3—S-49 "Jackhamers" drilling into the rocky face of the mountainside along the line of the projected highway.

2—"Hold up all trains; we are ready to blast". Telephonic communication was at all times maintained between the roadbuilders and the railroad, several hundred feet below, to safeguard traffic.



1—Compressor plant and blacksmith shop at the southern end of the job. 2—Section of the new 3½ mile highway that is being built to supplant an old road farther down on the mountainside. 3—Close-up of one of the mounted air receivers with its battery of three compressors. Two such units supplied all the air needed on the job. 4—Bucyrus-Erie steam shovel loading the shattered rock into a truck immediately behind. This picture gives a good idea of the cramped space in which the men had to work. 5—A stretch along Popolopen Drive around the north side of Bear Mountain. This road was completed last year.



Left—Reconditioning drill steels on a No. 33 sharpener for the gang at work on the north end of the Bear Mountain-Tomkins Cove Road. Right—Exterior of the same blacksmith shop, temporarily erected on the slope of the Dunderberg, and the three compressors that are supplying air to one-half of the road job. Note the air receiver between the portables and the shop.

system of scenic highways built and under construction is gradually opening up every part of the reservation, which is being visited year by year by an increasing number of motorists coming from near and far. The importance of this phase of the commission's activities becomes apparent when it is known that these roads, having an aggregate length of 70 miles, are now used annually by 2,500,000 automobiles. This is more than double the traffic recorded five years ago.

At the present time work is being pushed on a new highway around Dunderberg Mountain and extending from Bear Mountain to Tomkins Cove—a distance of 3½ miles. This road, like the famous Storm King Highway farther north, will offer a magnificent view of the winding Hudson and of the rolling country to the east. It is being built to take the place of an old asphalt road which now skirts the mountain on a line 250 feet lower down, and which is almost impassable during the winter months because of accumulating ice and snow. The Dunderberg so overshadows this stretch of highway that the sun never reaches it. Paralleling both roads, the tracks of the West Shore Division of the New York Central Lines run along the waterfront at the foot of the mountain.

Because of these conditions, great care had to be exercised in cutting the roadway out of the steep mountainside. In order to safeguard both automobile and railroad traffic as much as possible, blasting was done only infrequently—that is, comparatively long sections of the rocky ledge along the proposed route were first drilled and then broken out in succession. While this was going on flagmen were stationed on the highway to keep approaching motorists away from the danger zone; and so that the watchmen might have an unobstructed view of what was going on high above them, it was necessary to remove some of the intervening trees and underbrush. This signal system, however, was not practical in the case of the railroad; and to keep it informed of operations a 4-party telephone line was established. Flagmen posted at either end of the tracks lying within the affected area were thus given prompt warning before each blast, and they, in turn, stopped oncoming trains and did not permit them to proceed until word came from overhead that the path was clear. As a result of these precautions no serious accidents have occurred.

Construction of the project was started in June, 1929, and is being carried forward from both ends simultaneously. The drilling of both the lift and the vertical holes was done by S-49 "Jackhamers"—the rock penetrated consisting of gneiss covered with little overburden. Compressed air for these drills was supplied by six 9x8-inch Type 20 portable compressors divided equally between the two working gangs. Each compressor unit was linked up with an air receiver, also conveniently mounted on wheels. From the receiver the air was piped to the point of use, sometimes 700 feet away—the pressure even at that distance being at all times sufficient to operate from seven to eight drills.

Besides the equipment mentioned, each section had its own blacksmith shop, equipped with two coke forges and an Ingersoll-Rand No. 33 sharpener, where the drill steels were kept in condition. A Bucyrus-Erie steam shovel was used to load the spoils into two 5-yard trucks for removal to a nearby dump. This rock is utilized as fill in constructing the subgrade for the new highway which, at this writing, is fast being completed.

As now built, the road has a width of 34 feet. However, there is some question of widening it. In that case the face of the mountain will have to be cut back another 9 or, possibly, 15 feet before the laying of the concrete top course can be undertaken. In that event the Bear Mountain-Tomkins Cove Highway will not be opened to traffic for some months to come. The concreting will be done by the New York State Department of Public Works; while all the work just described has been executed by the Palisades Interstate Park Commission under the guidance of Maj. William A. Welch, chief engineer and general manager, and under the immediate supervision of Mr. J. J. Tamsen, superintendent of road construction.

Bear Mountain Inn which is open to the public the year round.

Air-Driven Pile Driver Does Good Work

CAHOKIA Creek—sometimes dignified by the more high-sounding name of Cahokia River—skirts East St. Louis, Ill., on the northwestern side of that city. Some day Cahokia Creek will probably be dredged to provide better means for water transport to and from the neighboring Mississippi River, which separates East St. Louis from St. Louis, the Metropolis of Missouri. And because Cahokia Creek is likely to be dredged in the future much extra work has recently been entailed in laying a gas main beneath the bed of that waterway.

In the course of its program of expanded service, the Illinois Power & Light Company decided to run a 10-inch gas main upon a line traversed by Cahokia Creek; and to do this the company was faced with the problem of placing the main so that the top of the piping should be not less than 10 feet below the bottom of the stream. Manifestly, this requirement could be met only by excavating a trench in the water bed to a suitable depth and by unwatering the trench prior to putting the main in position. The procedure followed is one that is quite commonly pursued in kindred undertakings. That is to say, the area to be trenched is enclosed within a cofferdam formed of sheet piling that can be driven close enough to produce a virtually watertight structure.

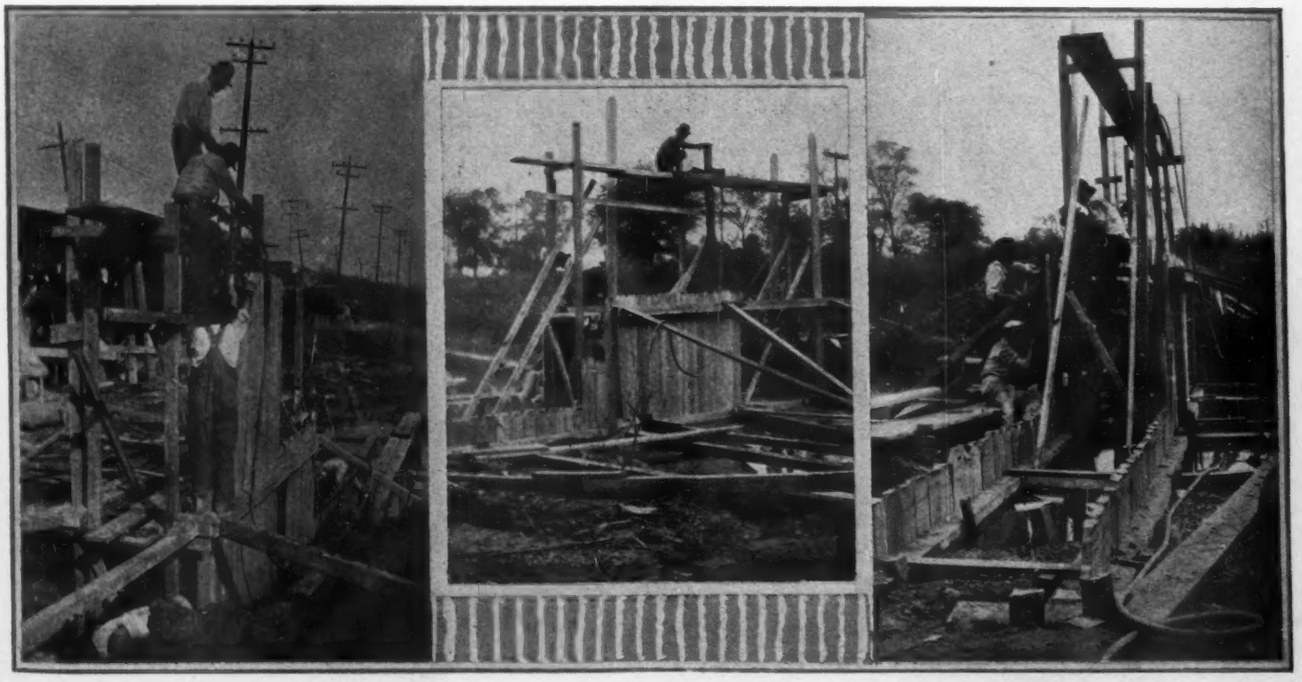
The contractor in the present case was G. L. Tarlton, of St. Louis, Mo.; and with the general scheme of operation agreed upon, the next question was how to drive the wooden sheet piles that were to be used in building the cofferdam. Each pile had to penetrate the ground underlying the creek bed for a distance of from 10 to 12 feet; and the contractor had to decide whether the work should be done by hand-sledging or by utilizing air-operated pile drivers of a portable and easily handled type—the necessary air to be furnished by a portable compressor. After due consideration, pneumatic equipment was chosen.

Close-up of the CC-45 pile driver at work on the Cahokia Creek cofferdam.

Each sheet pile was 2x8 inches in cross section and 16 feet in length; and the tool adopted to hammer them in place was an Ingersoll-Rand CC-45 pile driver. Its continuous service over a period of four weeks or more, without a single shutdown, amply proved that the tool was far superior for the work than hand-sledging—not to mention the fact that it drove the piles faster and at a lower cost than they could have been driven by any hand method.

Because the different piles encountered obstructions of various sorts—such as driftwood, tree roots, and limbs—in penetrating the clayey bed of the Cahokia, it was not possible to arrive at an average time for the driving of individual piles. However, the work progressed favorably, and the CC-45 was able to place anywhere from 30 to 50 piles a day, representing a combined linear penetration of from 300 to 500 feet per diem. Each pile was driven approximately 10 feet into rather sticky clay. The crew on the pile driver consisted of a foreman and two drivers, with a fourth man engaged in pointing the piles.

The contractor accomplished his purpose well within the time set by utilizing thoroughly up-to-date mechanical aids. The CC-45 pile driver employed by him is the outcome of much preliminary experimentation in order to produce a dependable tool that could be counted upon to withstand the shock and stresses incident to driving piles against considerable soil resistance and unknown obstructions and, at the same time, to drive the piles without damaging them.



Various stages in driving the sheet piling forming the cofferdam across Cahokia Creek, near East St. Louis.

FREEZING FISH BY NEW PROCESS

A NEW process for the refrigeration of fish has been developed by the Biological Board of Canada, a research branch of the Department of Marine and Fisheries at Ottawa. The method, says *Commerce Reports*, has been confined chiefly to freezing fish, although experiments along this line are now being made with beef and poultry.

When the fish are taken from the sea they are immediately cleaned, washed, and then iced in the ship's hold. As soon as the vessel reaches shore, the fish are taken to the refrigerating plant for processing, and those that cannot be butchered and frozen at once are placed in water slightly less salty than the sea water. This water is circulated through ice and is thus cooled to a temperature of between 30° and 31° F. As quickly as possible the fish are taken from the chilled water and the fillets cut from their sides so that no bones are included. Next the skin is removed, nothing remaining but fresh fish muscle.

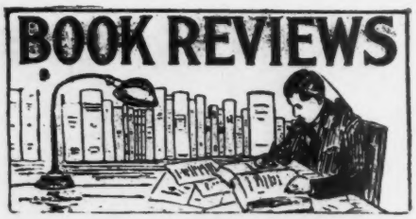
The fillets are cut into 5-inch pieces which are fed into a mold 5 inches long, 3 inches wide, and 1 inch deep, and having a capacity of ½ pound. Each mold is wrapped in a sheet of waxed, vegetable parchment and, with others of its kind, is placed in a metal frame of the proper size. So held, the blocks of fish are slipped into metal envelopes and immersed in a circulating brine having a temperature of zero Fahrenheit or lower.

The salty brine does not touch the fish, but is in close contact with them through the metal covering. Freezing is accomplished in 15 to 20 minutes; and, upon removal from the pan, the frame is filled with solidly frozen cakes of fish. Two of these cakes are put into a waxed carton, and 24 cartons are placed in a corrugated cardboard container lined with moss. For shipment, four of these containers are packed in a wooden box.

The theory under which this new process operates is that the quick freezing prevents the formation of large crystals, thus keeping the product in a better condition and helping it to retain the characteristics of fresh meat.

A Scotch engineer, says *Gas and Oil Power*, has invented an ingenious device that will prevent the excessive overheating of bearings and, incidentally, the damage caused thereby. It consists principally of a metal cartridge filled with a special lubricant. This cartridge is attached to the bearing, and, in case of failure on the part of the regular lubricating system, will flood the bearing with grease. Instant warning of the trouble is given by a strong odor thrown off by the grease the moment it comes in contact with the hot bearing. This emergency lubricator, it is said, should prove of value particularly to marine engines.

We are authoritatively informed that American industry is today 78 per cent electrified—50 per cent of the work being done with purchased power and the remaining 28 per cent with current generated locally by plants themselves.



POPULAR RESEARCH NARRATIVES, collected by the Engineering Foundation and published by the Williams & Wilkins Company, Baltimore, Md. Price, $1.00.

THIS is the third volume issued embracing research in many departments of our scientific and industrial life. The present volume contains narratives on 50 different topics, and each is a brief but thoroughly understandable presentation of the subject considered. Volume III, within its compass of 174 pages, deals with such widely diversified matters as distances of the stars; superconducting copper; boiling and roasting ores; inside-frosted lamps; a new use for chromium, the hardest of metals; the gyro's strange intuitions; chemistry in the desert; arch dams; wealth from cornstalks; motion pictures by anybody; ventilating vehicular tunnels, etc., etc. We heartily commend this and the preceding volumes of the series to all persons wishing to be well informed and yet having but a limited time daily to spend in reading. *Research Narratives* while written in a popular vein are nevertheless authoritative.

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION for the year ending June 30, 1928. An illustrated volume of 763 pages, published by the United States Government Printing Office. Price, $2.00.

AS usual, this annual publication of the Smithsonian Institution contains many extremely interesting papers having to do with a wide range of scientific subjects presented in a manner so lucid as to be interesting to the general reader bent upon keeping himself well informed on the march of human knowledge.

Much as we should like to dwell upon some of the topics, we must refrain here because of limited space. However, an idea of the diversity of matters treated can be grasped if we mention that the subjects discussed include: The stars in action; Astronomical telescopes; New results on cosmic rays; The hypothesis of continental displacement; The craters of the moon; Water divining; Birds of the past in North America; The controversy over human "missing links"; Communication among insects; Mounds and other ancient earthworks in the United States; and The physiology of the ductless glands.

FORESTRY, by Arthur B. Recknagel and Samuel N. Spring, professors at Cornell University. An illustrated book of 292 pages, published by Alfred A. Knopf, New York City. Price, $3.00.

THIS book is described as a study of the origin, application, and significance of forestry in the United States. The volume is not an academic treatment of the subject: it is designed, instead, to approach the topic from historical and economic viewpoints and to give the reader a general grasp of the many-sided forestry problem. The subject is one that concerns all of us, and, in turn, all of us should have some knowledge of the purposes of a forestry policy in its relations to the nation as a whole. While we have undoubtedly been tardy in taking steps to reforest cut-over timberlands to offset decades of destructive utilization, still the situation is not a hopeless one; and this book gives us heartening information about what has already been done towards conservation and replenishment. We commend it to our readers.

PRACTICAL SALESMANSHIP, by W. L. Barnhart. A book of 266 pages, published by The Ronald Press Company, New York City. Price, $3.50.

THE keynote of this really excellent book—written by a man thoroughly acquainted with his subject—may be found in a paragraph on the first page and in the first chapter of his treatise. Mr. Barnhart said: "Salesmanship, as it will hereafter be used in this book, may be defined as the power to persuade people to do what they hadn't intended or wanted to do—with a resultant profit to them from doing so." Please note that the object is not to induce people to buy something for the primary purpose of making the sale profitable to the salesman. The outstanding idea is to make that sale something of advantage or profit to the buyer. Speaking of the author—now deceased, an associate has said: "Bill had no patience with so-called high-pressure salesmen. He knew the difference between dominating a situation by the use of facts, logic, and enthusiasm, and attempting to dominate an individual by the use of bunk. He knew that to be successful a salesman must grow, and that to grow a salesman must go right on working!"

The author has written an extremely interesting and instructive book; and one does not have to be a genius to realize that the proper application of his precepts would make and mark a successful salesman.

TRANSPORT AVIATION, by Archibald Black, Air Transport Engineer. A copiously illustrated work of 348 pages, published by Simmons-Boardman Publishing Company, New York City. Price, $5.00.

TO many of us that are familiar with the earlier struggles of the designers and builders of aircraft—so fraught with uncertainties and so infrequently successful, the idea of a comprehensive volume on large-scale aerial transportation is significant of the technical and the mechanical progress that has been made between then and now—a comparatively brief span of years.

Of course, the volume contains much useful data of particular interest to aviators and to men directly engaged in building aircraft, but there is, besides, a wealth of information for others. For instance, the businessman interested in the possibilities of commercial aviation will have at his disposal a complete picture of this new industry ably painted. Instructors giving courses on transportation may find the volume serviceable as a text-book, while the general reader will learn from its pages what this new era in transportation portends.